TOXIC CHEMICAL POLLUTION IN PUGET SOUND

JOINT HEARING

BEFORE THE

COMMITTEES ON ENVIRONMENT AND PUBLIC WORKS

AND

COMMERCE, SCIENCE, AND TRANSPORTATION
UNITED STATES SENATE

NINETY-SEVENTH CONGRESS

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TOXIC CHEMICAL POLLUTION IN PUGET SOUND

MONDAY, OCTOBER 25, 1982

U.S. SENATE,
COMMITTEES ON ENVIRONMENT AND PUBLIC WORKS,
AND COMMERCE, SCIENCE, AND TRANSPORTATION,
Seattle, Wash.

The committees met at 2 p.m., in the south auditorium, Federal building, Hon. Slade Gorton presiding.

OPENING STATEMENT OF HON. SLADE GORTON, U.S. SENATOR FROM THE STATE OF WASHINGTON

Senator GORTON. I should like to call to order today's hearing of the Senate Committee on Commerce, Science, and Transportation, and the Senate Committee on Environment and Public Works, which will examine the issue of toxic chemical pollution in portions of Puget Sound.

There's been a great deal of attention to, and concern about, the problem of pollution in the Sound. The purpose of this hearing is to provide an opportunity for the public and for the Congress to hear from those engaged in basic research into the problem, to hear from those involved in regulatory work, both at the State and Federal level, and from public and private groups who are interested in the health of the Puget Sound.

I hope that today's hearing can serve to clarify what has already been learned, to dispel misconceptions about the problem, and to realistically evaluate where we need to go next. We will hear from a great number of witnesses today, so in the interest of having an opportunity to hear all of the scheduled witnesses, I ask each one of you to stay within his or her allotted time.

Your entire written statement will be incorporated into the record of the hearing. In addition, anyone may submit written testimony within 10 days of this hearing and that testimony will also be made a part of the hearing record.

I'm also delighted that Congressman Dicks was willing to come and join with me in this hearing as he has a very significant concern which he's expressed over a long period of time on the subject matter of the hearing. In addition to that, both Congressman Pritchard and Congressman Lowry have stated that they will join us for at least a portion of the hearing. And so we will have a significant number of people for each of you who is to testify to relate your problems to.

First, I think Norm wants to make an opening statement.

OPENING STATEMENT OF HON. NORMAN D. DICKS, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF WASHINGTON

Congressman Dicks. Senator, I appreciate very much the fact that your committee was willing to hold this very important hearing.

I think this issue is critically important to the people of the State of Washington and to those of us who care and are concerned about Puget Sound.

I have been deeply concerned that in my own district, the Sixth Congressional District, the Commencement Bay area, both onshore and offshore, has been designated as 1 of the 10 worst chemical dumping sites in the United States by EPA. And we're very concerned about trying to find constructive answers to the problem of what to do about the possibility of chemical contamination of our water supply in the Tacoma area.

And beyond that, we have been concerned about trying to work with State and the Federal Government and the local governments to try to come up with a constructive way to deal with this chemical pollution.

We have an area over in Bremerton near the shipyard that we are also concerned about.

I'm pleased because I know our delegation has always worked together in trying to come up with constructive answers, and I think this hearing will be a furtherance of that goal and objective. I appreciate the Senator letting us members of the House delegation participate.

Senator Gorton. Thank you. We'll begin with a panel from the National Oceanic and Atmospheric Administration, consisting of Drs. Harris, Bernard, and Malins.

I understand that you have a slide show for us.

STATEMENT OF DR. HOWARD S. HARRIS, MANAGER, MESA PUGET SOUND PROJECT, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Dr. Harris. Thank you, Senator Gorton.

My name is Howard Harris. I'm the manager of the MESA Puget Sound project. MESA stands for Marine Ecosystem Analysis. It's administered by the National Oceanic and Atmospheric Administration. I prepared some comments which I'd like to submit for the record.

Senator Gorton. Your comments will be included in the record in full.

Dr. Harris. The MESA Puget Sound project began a detailed investigation of the presence of toxic chemicals in the sound and their possible effect on the biology beginning in 1979.

The project has attempted to characterize the general situation in Puget Sound, but we have placed priority upon three of the industrialized embayments: Commencement Bay near Tacoma; Elliott Bay near Seattle; and Sinclair Inlet near Bremerton, Wash.

Our investigators have used a variety of sophisticated physical, chemical and biological techniques in this investigation which may be unique in their application to marine ecosystem or marine pollution investigations.

Our findings to date indicate that parts of Puget Sound have been impacted by man in a deleterious way. The evidence of this impact will be described in a moment.

The seriousness of the situation has led agencies to take action as follows: As Congressmen Dicks said, the Environmental Protection Agency has designated Commencement Bay for remedial action under the Comprehensive Environmental Response Compensation and Liability Act or Superfund legislation. The designated area includes the waterways near the Port of Tacoma as well as an abandoned deep water dump site in the middle of the bay. Also, the Seattle-King County Health Department and the Tacoma-Pierce County Health Department have issued public advisories against the consumption of shell fish and fish caught by recreational fishermen in certain parts of Elliott and Commencement Bays.

When we began our investigations into the presence of toxic chemicals in Puget Sound, one of the first tasks that faced us was to tell the chemists what we considered to be toxic chemicals and what kind of analyses they should perform.

We took as a general definition that a toxic chemical is a substance which can cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological or reproductive malfunctions, and physical deformities in any animal or its offspring. It's obviously a very inclusive definition.

But recognize the definition for what it is. That's how we began when we started to make our chemical analysis. That doesn't imply that we can classify a chemical as toxic because of observed or demonstrated effects on the biota in Puget Sound. Chemicals are designated as toxic in the sense that they have the potential to cause that effect, not that it's been demonstrated. The various analytical techniques that we have used are sensitive and have led us to be able to identify a great number of chemical compounds.

I've listed in the written testimony 15 compounds or classes of compounds which we feel to be of the greatest significance in Puget Sound. Some of these are chemicals that you frequently hear about with regard to marine pollution work: Chemicals like PCB's or polychlorinated biphenyls, arsenic, and cadmium. Others are ones you do not hear about nearly as frequently, such as chlorinated butadienes.

I'd like to make a few general observations of what we know at this time about the presence of toxic chemicals in the sound. I'll confine my remarks to toxic chemicals in bottom sediments.

No parts of the sound that we have sampled so far have been entirely free of toxic chemicals. The concentration or amount of toxic chemicals that we find is generally highest in the industrialized harbors and the waterways that are near port facilities, and the lowest in areas that are remote from the influence of man. There are gradations in between.

The geographical distribution for each chemical varies. Each may have a unique distribution. A hot spot for one particular chemical or class of chemical compounds is not necessarily a hot spot for another chemical. Particularly near the industrialized areas, using the techniques that have been applied, it's possible to identify a great number of chemical compounds. We typically can identify several hundred. With a good deal of analytical work and the effort that would go with it, we could perhaps identify several thousand compounds. That has not been done yet.

I have prepared one slide as a demonstration of our results. If I could call your attention to the little diagram in the middle of the slide, you'll notice that there are eight geographical areas named and numbered. For example, No. 1 is Port Madison; No. 2, Sinclair Inlet; No. 3, Case Inlet; No. 4, Budd Inlet; No. 5, Bellingham Bay; No. 6, Port Gardner; No. 7, Elliott Bay; No. 8, Commencement Bay. These numbers are used on the various diagrams to show the amount of chemical in that area.

I have also summarized the data in terms of eight chemical compounds: total aromatic hydrocarbons or AH's, total polychlorinated biphenyls or PCB's, chlorinated butadienes, hexachlorobenzene, mercury, lead, arsenic, and cadmium.

The values that appear on the left side of the diagram are the average concentrations of that particular chemical or class of chemical in parts per billion of dry sediment. Across the bottom is the number of samples represented in that average.

So we can interpret this diagram in this way: For chlorinated butadienes in area 8, or Commencement Bay, the average of our samples is about 1,600 parts per billion, and that's based on an average of 27 samples collected in that area.

Overall, what kind of distribution of chemicals in sediments do we see? For areas 7 and 8, which are Elliott Bay and Commencement Bay, we notice that averages are higher than for other areas for aromatic hydrocarbons, PCB's, and lead.

On the other hand, Commencement Bay is uniquely high in chlorinated butadienes and hexachlorobenzene. Mercury is highest in Bellingham Bay. Arsenic is high in Budd Inlet, area No. 4, as well as Elliott and Commencement Bays. Cadmium is highest in area 4, which is Budd Inlet. And Sinclair Inlet, which is area No. 2, has moderate amounts of a number of these chemicals, though not unusually high.

The picture I would like to leave with you is that the distributions of the chemicals vary greatly by geographical area. There's no common picture. And when it comes to the interpretation of these data in terms of biological effects, you have the interplay between a great number of chemicals in any particular area. The biological significance of the presence of these toxic chemicals will be discussed in testimony to be presented later.

Mr. Chairman, I appreciate greatly the opportunity to present these findings to you and the committee.

Senator GORTON. Thank you. We'll go on to Dr. Bernard, and we'll save our questions for all of you.

STATEMENT OF DR. EDDIE N. BERNARD, ACTING DIRECTOR, PACIFIC MARINE ENVIRONMENTAL LABORATORY, ENVIRONMENTAL RESEARCH LABORATORIES, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Dr. BERNARD. Good afternoon, Mr. Chairman. My name is Eddie Bernard. I'm the acting director of Pacific Marine Environmental Laboratories, of NOAA's research and developmental laboratories here in Seattle. Our Laboratory contributes to three general areas of

NOAA's interest and research, including climatic interactions of the oceans for better forecasting climate, better predictive capability of ocean services related research, and marine environmental assessment.

Marine environmental assessment, of course, is the topic of our discussion this afternoon.

For the last 9 years, our laboratory has been engaged in numerous field investigations of Puget Sound in trying to understand the complex nature of the transport of water and sediments.

The research has been funded by the Environmental Research Laboratories, marine ecosystem analysis program, and long-terms effects program. Information from this research is the basis of my testimony today.

In Puget Sound, we see two distinct classes of pollution problems. One is the acute problems associated with localized short-term industrial activity. And in the second class of problems, we see the long-term growth activity.

The short-term events have created most of the concern and they were reported on by Dr. Harris.

The long-term, growth related problems are largely those of the disposal of municipal waste including both the level of treatment and the location of the disposal sites. Both the short-term and long-term classes of pollution problems tend to be confused, but they have different origins and different controls over remedial strategies.

In understanding the transport of particular bound pollutants, both classes of problems must be considered. Ultimately, most pollutants, if not in particular form, become bound to particles.

Two aspects of behavior of suspended particulates must be considered. One is that they act as an agent for transporting materials, and two, they act as a site for various chemical and biological activities taking place. So, I'd like to leave with you this thought that in our scientific evaluation, we feel that most pollutants will adhere to these particles or else become the site of activity surrounding them. So, therefore, it is the transfer of the particles that are of most concern in understanding pollution problems.

The general approach of our transport studies has been to break it down to the concept of sources of these particles, the residence time of these particles, and ultimately how they may leave the system, a sink if you will.

The source areas of course are the rivers and embayments. In Puget Sound it would be the Duwamish River, Puyallup River, and Sinclair Inlet. In these particular areas, toxic metals combined with dissolved organic compounds and combined forms precipitate on entering salt water. Most toxic organic compounds are insoluble in water and either precipitate in salt water or bind to sediment particles. Dissolved metals and organics are assimilated by plankton and converted to solid waste or dead cells which fall through the water column.

Thus, the most toxic compounds entering the Puget Sound are associated with organic solids or inorganic sediments. Once in the main basin, these suspended particulates are transported vertically by settling and resuspension. Regional distribution is brought about by horizontal water motion and possibly weak density sliding, that is a slump, if you will, of the mud.

So that would represent the activity in the Sound itself.

Finally, how are these contaminants lost? There are several mechanisms. They can interact with the atmosphere, which then goes away from the Sound area. They may be buried in the bottom sediments. They may be removed in harvested organisms or by flowing northward over Admiralty Inlet.

One final note I'd like to make about the transport of suspended particulate matter is that it is not entirely dictated by the transport of water. If I may use the analogy of a helium-filled balloon, that is, when you release it into the air, it is of course moved by the winds, but it continues to rise.

Similarly, a particulate or particle will continue to drop through the water column. Even though it's transported by water, it continues to drop. So there's a little bit of difference between where the particulate will ultimately reside with respect to the water transport.

Now, I'd like to turn your attention with these general concepts to Puget Sound. To orient you, of course, this is the main basin of Puget Sound, the narrows down here near Tacoma, Admiralty Inlet up here to the north. Generally speaking, we can describe Puget Sound as being a two-layered water system. That is, a light, fresh water, surface layer overlaying a more dense, cold, saline bottom water.

The general circulation of water in Puget Sound would be that there's a general tendency for the surface water to transport out of Admiralty Inlet in this general direction. Down near Vashon Island there seems to be a surface recirculation. Surface water generally is transported to the south, comes back to Colvos Pass, and then continues north.

This is more or less driven by the river runoff in the system. Now, that's the surface light layer.

The bottom, more dense layer, comes in through Admiralty Inlet. As the fresh water is overspilling Admiralty Inlet, it is replaced by the more dense, saline water and it has a general southward drift in this direction.

To give you some idea of the times involved, it would take perhaps on the order of a week for water entering through Elliot Bay to make its way out of Admiralty Inlet. During this process, though, Pudget Sound is the only fiord-like estuary in the lower 48 continental United States. And as such, it has a peculiarity in its recirculation pattern.

And as the water is transporting up here, this sill at Admiralty Inlet tends to act as a mechanism for intense mixing in this particular area. Perhaps two-thirds of the water coming out of the Seattle area is remixed downward. It then mixes with the bottom layer which is moving southward on the order of about a month. So we can see the system setup such that water would be entrained in the system, continuously recycling, on the order of about a month.

Now, that's the way the water is transported. I'd like to draw your attention to the issue that I raised earlier, and that is that we feel we need to understand the transfer of the particles.

Now, a particle would come out of, say, for instance, the Duwamish River, flow outward, and would mix in this outwardly flowing top layer that I discussed earlier. Either through the action of gravity or recirculation, it will drop down to the bottom layer, and in this bottom layer, the net transport to the south. In a resuspended state, or a very loosely suspended state, it could take on the order of months for particles to work their way south. And we feel there's evidence that strongly suggests that there are preferred areas for which these particles will ultimately reside.

So, I hope I've given you an idea of the conceptual nature of our understanding of the transport of particles in water in Puget Sound. One of the things I'd like to point out is that these are generalities and we have no specific quantitative measures.

But I would like to leave you with what we feel is perhaps an approach to the two problems that I raised earlier. In those particular areas where there are high impact, high concentrations from toxic materials, we feel like those should be handled on a case-by-case basis. That is, the stability of sediments and a host of parameters which we can't describe, in general, and this would have to be handled on a case-by-case basis. The slow accumulation, trickling effect of all the sediments into the Sound, and we think perhaps as many—as large portion of those particles remain in the Sound—we think the most rational approach is to develop predictive models which can quantify the distribution and ultimate residence of these particles once they get into the Sound. But as of this time, we have no quantitative measures which we can use.

Senator Gorton. Thank you. Dr. Malins.

STATEMENT OF DR. DONALD C. MALINS, DIRECTOR, ENVIRONMENTAL CONSERVATION DIVISION, NORTHWEST AND ALASKA FISHERIES CENTER, NATIONAL MARINE FISHERIES SERVICE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Dr. Malins. Mr. Chairman, I am the Director of the Environmental Conservation Division of the Northwest and Alaska Fisheries Center of the National Marine Fisheries Services, a component of the National Oceanic and Atmospheric Administration.

Since 1972 we have studied relations between pollution and disease of marine life in urban and nonurban areas in the Puget Sound.

May I have the lights off and the slides, please?

These industrialized and highly populated urban areas include Elliott Bay near Seattle, Commencement Bay near Tacoma, Budd Inlet near Olympia, Sinclair Inlet near Bremerton, and Port Gardner near Everett.

Nonurban areas studied were Case Inlet in south Puget Sound, Port Madison and Port Susan in central Puget Sound, and Discovery Bay which opens onto the Strait of Juan de Fuca.

We found in these studies, Mr. Chairman, that the bottom dwelling fish and shellfish take up complex mixtures of potentially toxic chemicals from their environment and store them in tissues including the edible muscle. Generally, the amount accumulated is directly related to the extent of the pollution. That is, fish and shellfish in relatively clean areas, such as Port Madison and Case Inlet, build up very low levels of chemicals; and those living in urban areas such as the Duwamish River along Seattle's waterfront or in the Commencement Bay waterways accumulate substantially higher levels and greater numbers of chemical contaminants in their tissues.

May I have the slide off and the lights, please?

Many of the chemicals found in marine organisms from polluted areas, some of which are carcinogenic, are converted to other potentially toxic substances by the organism. For example, hydrocarbons from combustion processes and from petroleum are transformed in the bodies of marine fish into a variety of other toxic compounds. We have evidence that some of these compounds react with DNA of fish liver cells, a process that is believed to be a key step in liver tumor formation.

A matter of obvious concern is the extent to which the chemicals are transported through the food chain. Little informaion is actually available on this, but many of the chemicals, such as metals and chlorinated compounds in particular, are passed on from fish to higher animals and thus create potential problems for birds, marine mammals, and the human consumer.

So to summarize what I've said so far, Mr. Chairman, fish and shellfish tend to reflect in their bodies the types and levels of pollutants in their habitats. The accumulated chemicals are stored in tissues for various periods, and as I indicated, many are transformed into various other chemicals. The end result is that various amounts of myriad, potentially toxic chemicals, some of which can be identified and some of which cannot, are present in fish and shellfish from urban areas in the Puget Sound.

The great complexity of these chemical mixtures and the general lack of information on their effect make it virtually impossible to presently define their impact on marine life or the human consumer.

One of the major objectives of our research was to find if there are links between toxic chemicals and diseases in fish and shellfish.

We found areas with highly contaminated sediments tended to have bottom fish with a variety of serious abnormalities, particularly of the liver, but also of the kidney, gills, and other tissues. The fish examined most intensively included English sole, rock sole, starry flounder, and Staghorn sculpin.

Because of time limitations, Mr. Chairman, I'll describe only some of the liver diseases in English sole. Let me point out that, to the best of my knowledge, the liver diseases which I'm about to describe are not communicable to humans.

Major types of liver diseases observed were benign and malignant tumors and degenerative lesions. The most severe cases of these diseases were recognizable to the naked eye. Normal appearing livers are generally uniformly colored and range from reddish-brown to creamy pink, as shown.

Liver tumors, shown in the next slide, appear as nodular discolorations, and livers with severe degenerative lesions, shown in the next slide, have a mottled appearance.

I wish to emphasize, however, that all final diagnoses of liver lesions are made by microscopic examination of tissues.

The next slide shows the geographical distribution of English sole with liver tumors in Puget Sound. An important finding is that liver tumors were found only in fish from the urban areas. English sole from the Duwamish River and Everett Harbor had the highest frequencies of these essentially nonreversible conditions. In the Duwamish River, 16 percent of the English sole examined had liver tumors, whereas 12 percent of the total examined so far from Everett Harbor, that is near Pier 1, were similarly affected.

As shown in the next slide, the geographical distribution of English sole with degenerative lesions was similar to that of sole with liver tumors. They were most prevalent in the most chemically contaminated areas of Commencement and Elliott Bays, and the Everett Harbor.

Our data for the Everett Harbor show the highest prevalence; 53 percent of the English sole in the Everett Harbor had degenerative lesions of the liver, a value which is more than twice that found in the Duwamish River, the area with the next highest prevalence.

Slide off and lights on, please.

The fact that the severe forms of liver disease were found primarily in fish from areas near industrialized or highly populated areas, clearly implicates pollution in their cause. Additional evidence implicating pollution is the finding that the lesions are similar to those reported in other animals, including mammals exposed to toxic chemicals under laboratory conditions.

As a step in defining cause and effect relationships between the chemicals and lesions in the bottom dwelling fish, we statistically compared the prevalence of fish with diseases with the chemical composition of sediments. We considered four main classes of chemicals in sediments in Puget Sound. They were aromatic hydrocarbons, metals, polychlorinated biphenyls (PCB's), and other chlorinated organic compounds, including pesticides. We found that a very high correlation exists between levels of aromatic hydrocarbons and metals and prevalences of sole with liver diseases.

Thus, we have been able to focus on certain types of chemicals that appear to play an important role in tumor formation and other serious diseases in Puget Sound fish. By identifying chemicals that are linked to disease in this way, Mr. Chairman, we're addressing the important question: "Of the large numbers of chemicals in urban marine environments, which ones should receive priority attention in regulating inputs or in cleanup operations?"

The highest numbers of invertebrate species were found in the outer portions of urban marine areas and in nonurban areas, whereas the lowest numbers were found in the urban waterways and the inner portions of urban estuaries.

The number of species of clams and worms was substantially lower in sediments having the highest concentrations of metals and aromatic hydrocarbons. Thus, the more severely polluted environments of Puget Sound appear not to be viable habitats for some invertebrates.

Our data also show that the numbers of fish caught were lower in the more contaminated areas of the urban bays than the nonurban bays. We are not sure if this is because the fish avoid these environments or because their survival rate is lower in these areas.

In summary, Mr. Chairman, our field studies in Puget Sound have revealed toxic chemicals and serious diseases in fish and shellfish in highly urbanized and industrial bays. In addition, communities of bottom dwelling fish and invertebrates appear to be altered in those portions of the urban bays which have the highest levels of chemical contaminants.

There is at present no evidence, let me say, that commercially marketed fish and shellfish are afflicted with these diseases or that they contain high levels of foreign chemicals in their edible tissues. It should be emphasized that the commercial fishing areas of the Puget Sound are not in the highly polluted industrialized areas.

However, even though it appears that commercially marketed fish and shellfish from Puget Sound are still wholesome for the consumer, the same situation may well not be true for the recreationally caught bottom fish from the urban bays.

I would like to conclude with a brief summary of our most recent findings in the Everett area.

May I have the next slide and the lights down, please?

In September, Mr. Chairman, we examined additional fish and also Dungeness crab from the Everett Harbor and the results with the fish support our earlier findings of a high incidence of English sole with liver tumors. Our sampling in the Everett area included collecting English sole from three additional sites in Port Gardner. One site was adjacent to the Everett Harbor, shown in orange.

Another was across from the harbor just northwest of the mouth of the Snohomish River, shown in blue. And the third was next to Harbor View Park, about one nautical mile from the Everett Harbor, shown in yellow.

These results clearly indicate a gradient of liver tumor incidence exists in the Everett area with the harbor appearing to be the "hot spot," shown in maroon, and the areas outside of the harbor having lower disease incidences.

May I have the next slide, please?

The same gradient exists for English sole with degenerative lesions.

Turning now briefly to diseasess in the crabs, in a preliminary examination of Dungeness crabs collected from the pier 1 area of Everett, three out of the small sampling of eight showed definite, pathological abnormalities which we believe may be pollution related.

May I have the lights on, please?

Mr. Chairman, I have here a graphic example of a normal and diseased English sole liver which, if I may, I would like to present to you for your perusal.

I appreciate having the opportunity to present this testimony on what is obviously a very important problem.

Senator **Gorton**. Thank you very much. I think we can pull the screen up.

I should like to thank each of you for your testimony and to state the obvious that we have now been joined by Congressman Lowry and Congressman Pritchard.

I would like to note once again the interest in the problem before on the part of the Members of Congress for the Puget Sound area.

I will have a series of questions, many of which I will, out of necessity, have to submit to you in writing because of the limited time today. But perhaps just in order to clarify some of the elements of the problems which you have already outlined, I would like, in lay terms, to ask a couple of questions about the geographical nature of the problem.

As I understood it, Dr. Bernard, you pointed out that a pollutant emanating from a given source can, in fact, be transported some distance in two different directions; that is, one direction being the general direction of the sound near the surface, and the other direction being as it falls deeper into the sound. And yet, Dr. Malins' testimony on the location of disease to the fish and shellfish, especially English sole, showed striking differences within the same general area. Perhaps each of you could comment on that fact. Does this show that so far the actual transportation of pollutants is at such a relatively low level that the serious problem is confined to a relatively small geographic area? And second, Dr. Malins, is this an indication that at least the kind of shellfish and English sole which you have studied are the type of fish which simply don't travel far during the course of their lifetimes?

So, even when we move a mile, as you indicated in the upper bay area, you can go from a fairly serious problem within an area to an area with no such problems at all?

Perhaps each of you could comment on these questions.

Dr. **Bernard.** Senator, let me say that perhaps the general nature in which I described the transport of particles is, as you can understand, a system where it would flow freely. Recall, however, that there are numerous depth sites that are required in order to maintain levels of outflow from the rivers.

So, by these nonnatural events, you have created, in fact, very concentrated areas for these pollutants.

Our understanding of the transport of these materials is, as I described, rather general in nature, and to be very specific would be difficult to do at this time. But I think—hope that addresses your question, that these are created by man, some of these hot spots, not by nature.

Dr. **Malins.** I think, Mr. Chairman, that it's rather difficult to determine at this time to what extent the English sole may be coming into these contaminated urban bays, or, in fact, leaving them. But I get the impression that one is probably dealing with a rather steady state population.

The fact of the matter is that the urban bays are really extremely polluted and that, as a consequence, the animals are being rather heavily exposed in these regions. The diseases which we are talking about are the consequence of rather severe exposure, in my judgment.

Senator **Gorton.** Do you have any comparative studies from a decade or so ago that would indicate to you whether the problem is getting worse, staying at a steady level, or gradually improving given the present nature of practices relating to the discharge of pollutants?

Dr. **Malins.** Well, at the moment, Mr. Chairman, we simply don't have the monitoring program which would really be required to answer that question. There is some indication from some work which we've just completed, sponsored by the Puget Sound MESA program, as a matter of fact, which gives us some provisional indication that there are areas which may be showing a decline in certain diseases, and I would give you an example of the Sitcum waterway with respect to liver disease; other areas exist where it would appear that some of these serious diseases may in fact be increasing in incidence. Those areas which I would point to in this regard are South of Harbor Island in the Duwamish, and along the Seattle waterfront.

I think that this variation where one finds incidence going up and incidence going down is quite expected in the heterogeneous circumstance which we have in Puget Sound.

Senator **Gorton.** Finally, your studies on fish were concentrated, at least in your slides and your testimony, on English sole. Is there any indication that the kind of pollutants with which we are dealing in these areas have had any impact on any other kinds of fish, such as salmon?

Dr. **Malins**. Well, the issue with the salmon has not been studied extensively, in my view, but we did conduct a study with both salmon and cod which were obtained from both Commencement and Elliot Bays; we were unable to find any pathological conditons, and we found that the levels of chemicals in the fish were extremely low.

The bottom line is that we have no evidence at all to suggest that either of these species are seriously affected by this problem at this time.

Congressman **Dicks**. Well, first of all, I want to compliment you on a very excellent discussion of this issue. One of the areas that you have touched on, of course, is Commencement Bay, and I noticed that there are indeed greater concentrations of certain chemicals, such as PCB's and HCB's in Commencement Bay.

I think it's important to remember that between 1950 and 1972, over 256,000 tons of chemical waste was dumped in the middle of Commencement Bay.

And after the Clean Water Act was put into place, that practice was stopped. Now, one of the things that I have been concerned about is that the Office of Management and Budget, you know, trying to hold down spending, has recommended a reduction of $6.83 million to the marine ecosystems analysis budget.

And all of us here at this table are working in the Congress to try and get that money restored, because we understand that without that money, the kind of research you've been doing here on Puget Sound would be basically brought to an end.

Is that an accurate reflection of the budgetary situation, or at least be sharply curtailed?

Dr. **Harris**. Yes, Congressman, that's correct as far as the MESA Puget Sound project is concerned.

Our money has come in the past from this particular line item. I can't speak for the other two members.

Dr. **Malins**. Well, I can only say, Congressman, that at the present time we are continuing research on a number of areas, which are very germane to this issue, at the Northwest and Alaska fisheries center.

Congressman **Dicks**. Well, you certainly don't think your research is over?

As we talked about this, I think, some time ago, we are talking a long period of time to analyze the problem in order to try and decide what we can do, if anything, about it.

Which does raise the most important difficulties when you talk about the chemicals which have gotten into the sediments, into the bottom. What do you do?

That's an issue that has troubled me from the start. But one thing I think we're all certain needs to be done is stopping the chemicals that are still leaching into the waterways, particularly in our port areas where we do have major chemical operations. Certainly that is a first step in trying to attack this problem, wouldn't you agree?

Dr. **Malins**. I certainly am very much in favor of any reasonable effort that can be made to stop the input of chemicals into Puget Sound.

Congressman **Dicks**. And it's important, I think. We passed the Superfund legislation which is supposed to be the way to deal with this problem, and the money is there to be utilized—not just to do research.

What you're doing comes under NOAA, of course, but under EPA, we have the ability, I think, to address these problems if there is proper enforcement of the law.

Senator **Gorton**. Congressman Lowry?

Congressman **Lowry**. Thank you, Mr. Chairman. I want to thank you for having me at this important hearing and inviting us to participate today.

I want to thank the panel for an excellent presentation.

I think, you know, we are all concerned about the chain system of going on up to other fish. For instance, there have lately been proposals and moves for hatchery salmon that stay within Puget Sound for all kinds of reasons rather than going on out into the ocean and coming back. Do we know whether hatchery salmon that stay within Puget Sound thereby would be feeding within that habitat?

What are the chances of those being affected by this toxic waste?

Dr. **Malins**. Well, Congressman, the example which I gave with regard to salmon just a moment ago did involve fish which apparently do spend a significant amount of time in this area.

Congressman **Lowry**. What if they stayed wholly within this area? I mean, what if we developed hatchery salmon the purpose of which was to stay here instead of west of the Canadian intercept and all that, and stayed within Puget Sound?

How do we know what the effect on those salmon would be from this whole subject area we are discussing here?

Dr. **Malins**. Well, from my point of view, I don't feel there is adequate information available for me to be able to speak confidently one way or the other.

Congressman **Lowry**. And I think that's an excellent answer, and I think it gets to the point that we ought to be allocating funds so there could be adequate research done on all of these questions.

I hope in this effort to bring Government spending under control that we do not lose sight of the fact that there are some very important things that everybody on this panel supports doing.

And I would hope that the lack of information on that type of question—and there must be hundreds of those types of questions, and it's not possible for a scientist to really answer—indicates that we definitely need substantial adequate funding for the NOAA research program.

Senator **Gorton**. Congressman Pritchard.

Congressman **Dicks**. I noticed he got here as soon as we started talking about Everett.

Congressman **Pritchard**. Right. I wouldn't want you to spend all your time on Commencement Bay.

Well, two things I'd ask the gentlemen. One, do we have adequate information as to the source of the chemical toxins?

What's coming in, where's it coming in? Do we have a good fix on that?

Dr. **Harris**. Congressman, if you're talking about materials that enter from around the Sound, such as waste water discharge or air pollution, that has not been a part of our program to date. We have been examining the presence of chemicals already in the Sound and not looking at external sources.

Clearly, the bottom sediments, from one point of view, are a source of chemicals to the animals in the overlying water.

Congressman PRITCHARD. But you really need the overall, don't you, to do an adequate job on this?

Dr. HARRIS. In the case of Commencement Bay, beginning approximately 2 years ago, we have been working with the Environmental Protection Agency and with the State of Washington Department of Ecology in their actions to characterize or measure what is coming in from the different discharges around Commencement Bay. But that has not been an integral part of our program.

Congressman PRITCHARD. On the other hand, do we have a similar situation wherein some other part of the country, where we've had adequate tracking, we've done something where we can look and say, "Well, this port, it's rather similar, and that is what's happened."

Dr. HARRIS. I think I can answer a portion of that question from a physical transport side. Puget Sound is unusual with respect to its configuration. It is a very deep estuary with shallow sills at both ends, so it's somewhat confined considering flushing. Most estuaries in the continental United States (lower 48 States) are of another type where residues flow out to the ocean in gradually increasing depths of water.

So, in this regard, Puget Sound is an unusual system and has certain flushing characteristics which are unique.

Congressman PRITCHARD. In other words, we have to get this information on our situation here, and what's happening in other areas, we can't positively depend on that.

Dr. HARRIS. I confined this remark to the circulation characteristics. Certainly, the evidence about chemical reactions and effects on the biota will still be transferable to some degree.

But I wanted to point out the uniqueness of the circulation. It is different from the typical estuary in the continental United States.

Congressman PRITCHARD. Sure. We all feel it's an unusual body of water, and that is why we wanted to get these studies——

Dr. HARRIS. Excuse me, this is just one part of the question.

Perhaps Dr. Malins can add to the effects upon——

Congressman PRITCHARD. Yes. I'd like to know what Dr. Malins has to say.

Dr. MALINS. Well, Congressman, it's important for me to stress that the ability to really assess polluted environments is dependent upon the capability one has, and I believe we have had some high level of sophistication, scientific sophistication, in approaching these problems. So we have actually tended to flush out perhaps a lot of problems which might not have been seen otherwise.

It's very difficult to make across-the-board comparisons, but I might point out to you that there are environments, such as Chesapeake Bay, in which the sediments contain literally hundreds of toxic chemicals as they do in our own environment.

Exposure to these Chesapeake Bay sediments, in fact, brings about very substantial mortalities to a number of forms of marine life. But the approaches which we have taken in Puget Sound to link the chemistry to biological damage have, to my knowledge, not really been applied elsewhere, or at least not applied in the same way.

So, it makes an answer rather difficult. My general expectation would be that where you have high concentrations of potentially toxic compounds in an urban type marine environment, you are going to find animals with certain types of pollution related diseases.

Dr. HARRIS. If I might add one final thought. It could be that the kind of strategies and techniques that are being applied here could be applied elsewhere in the country for the purpose of developing a basis for comparison.

Congressman PRITCHARD. Good. That will give us a little better reasoning for having the operation go on here and point out to our brothers and sisters in Congress that this is just not a local effort.

Congressman DICKS. Do these chemicals, do they just kind of exist wherever? Do they dissipate at some point? How long—assuming we could work out a way to stop additional chemicals from getting into the Sound, or at least severely reducing it, how long is this problem a very serious one?

Dr. HARRIS. We speak of toxic chemicals almost as though it was a singular, but as you well know, it's myriad chemicals, some of which are exceedingly persistent; for example, the metallic ions will be here indefinitely. Many of the organic chemicals appear to be rather persistent, probably lasting on the order of years, if not decades. On the other hand, certain others are dissipated or perhaps degraded very rapidly.

So, it depends on the particular chemical or class of chemicals.

Senator GORTON. I'd like to thank this panel. And as I said, we'll have some additional questions which we will send to you in writing and ask for your response. Thank you very, very much.

Our second panel consists of two John Spencers, one from EPA and one from the State department of ecology.

If you two gentlemen will come forward, we'll start with the EPA presentation.

STATEMENT OF JOHN R. SPENCER, REGIONAL ADMINISTRATOR, REGION X, ENVIRONMENTAL PROTECTION AGENCY

Mr. JOHN R. SPENCER. Thank you, Senator and Congressmen. It is indeed a pleasure to be here today.

My name is John R. Spencer. To my left is John F. Spencer, a little older than I. He's with the State and I'm with the Federal Government.

I am the Region X Administrator for the Environmental Protection Agency. In my comments today I would like to briefly review the problems of toxic contaminants in Puget Sound from our perspective, the EPA's, review EPA applicable authorities and how we're applying those to address the problems, and I'd like to conclude with a short discussion of our future needs and actions.

Because Puget Sound is one of the most biologically productive and recreationally important estuaries in the United States, it is different than the other estuaries mentioned awhile ago, such as Chesapeake

Bay, because it's deeper and it has a bit different actions, as Dr. Malins and his associates said.

The achievement and maintenance of a high-quality aquatic environment is vital to the economy and quality of life to all of us here in the Northwest.

Fortunately, most of Puget Sound still may be categorized as healthy, productive, and of high quality, even though the region has experienced continued growth and development. Much has been accomplished but we still face some difficult problems as evidenced by the subject of this hearing.

Actual and potential pollution problems in Puget Sound were recognized many years ago. As a matter of fact, we have reports in our library, Senator Gorton, to the old Federal Water Pollution Control days, some 20 years ago, that recognize some of these same problems we're talking about today.

These problems ranged from dissolved oxygen depression and sludge accumulations to toxic effects of industrial waste discharges.

Due to the continued efforts by Federal and State pollution control agencies over the last 20 years, industry and municipalities have achieved significant improvements in the level of waste treatment provided.

During this period, for example, the pulp and paper industry on Puget Sound has spent well over $100 million in that industry alone for pollution control. The result is a reduction in the discharge of biochemical oxygen demand from 2,200,000 pounds a day in 1967 to 94,000 pounds a day in 1982, or 96 percent decrease or reduction.

In other areas, Federal, State and local agencies have successfully demonstrated techniques for solving urban-runoff and other nonpoint source problems, and have seen improved water quality in a number of areas as a result of their efforts.

Of equal importance, the regulatory agencies have prevented significant degradation of Puget Sound water quality through their efforts to evaluate potential impacts and to require mitigation measures on the part of new or expanding pollutant-generating activities.

A lot of these, Senator and Congressmen, EPA and other environmental agencies have caught it on the chin, but they've stuck by their guns continually requiring this mitigation issue.

Despite these successes, problems remain. Most of these are a continuing legacy of past practices. Our scientific ability to measure and analyze has increased manifold in recent years. These techniques have been applied to Puget Sound, and in particular the urbanized, industrialized embayments, by various Federal and State agencies such as NOAA, EPA, and the State Department of Ecology.

I should also add in there, Metro here in the Seattle area has done probably one of the most outstanding jobs in the United States. A comment that I think, Senator Pritchard, you made, do we know more or is it an unusual situation? The fact of the matter is that we know more about the Puget Sound than they know about Chesapeake Bay. And that sometimes gives rise to additional concerns.

As a result, we have become increasingly aware of the problem of toxic contaminants. Presently, we are faced with a number of problem areas where chemical contamination is shown by diseased fish and elevated contamination levels.

Due to these findings, major questions have been raised about risks to public health from consumption of contaminated fish from these areas.

In addition to these immediate and pressing concerns in the urbanized areas, there is growing concern regarding the long-term cumulative effect of chemical contamination in Puget Sound as a whole. As we apply our more sophisticated scientific procedures to the Sound, trace levels of toxic contaminants are found in many areas now thought of as healthy.

The information available at this time is inadequate to determine if these levels are increasing or decreasing. The long-term cumulative effects are really unknown to us.

It is my view that dealing with the problems of chemical contamination in the Sound requires a three-pronged approach.

We must collectively control current and potential discharges of contaminants, aggressively move to address current problems in the urban industrialized areas, and put in place an evaluation and management program to deal with the question of long-term chemical contamination in the entire Sound.

EPA has responsibility for implementation of a wide variety of legislation which bears on the problems of toxic contamination. The Clean Water Act requires that discharges of municipal and industrial waste be effectively regulated through permitting and enforcement programs.

At this point, Puget Sound is both a State and a Federal responsibility inasmuch as the NPDS or those discharges from the water have been transferred to the State for their consideration; we work together on that.

The Resource Conservation and Recovery Act provides authority to regulate the transport and disposal of hazardous chemical wastes.

The Comprehensive Environmental Response, Compensation, and Liability Act, or Superfund, as Congressman Dicks pointed out, provides additional authorities to address uncontrolled or abandoned hazardous waste sites.

All of these authorities are currently being applied by EPA to the problems of toxic contaminates in Puget Sound. Before discussing some specific examples, however, I would like to address EPA's role in dealing with health risks.

EPA has a well-defined role in protecting the environment from the effects of toxic and hazardous chemicals. These authorities involve the setting of standards, for example, water quality standards, the establishing of priority lists of chemicals subject to regulation, and the establishing of specific discharge limitations.

EPA also has authorities to respond to spills and emergencies involving hazardous and toxic chemicals. The protection of public health is a direct and primary consideration in our implementation of these regulatory authorities.

In addition, we provide technical and financial support to the health agencies which have the medical expertise and are better equipped to deal with local questions of health risk.

With respect to the Puget Sound, we are actively involved in coordinating and supporting the efforts of such agencies as the FDA, Food and Drug Administration, the State department of social and health services, and local community health agencies, such as R. M. Nicole, Pierce County, which is probably one of the finest, at least in this area, I've ever known.

I would now like to briefly discuss some current activities which EPA has underway that are directly addressing the problems of toxic contaminants in Puget Sound.

EPA and NOAA jointly became concerned about Commencement Bay several years ago. We began discussing with NOAA staff their preliminary findings of diseased fish and elevated contamination levels in Commencement Bay.

While these preliminary findings also indicated problems in the Duwamish River/Elliot Bay system at Seattle and in other embayments, the problem at Tacoma seemed to be the most significant and severe.

Initial water quality and source investigations were conducted by EPA and the Department of Ecology of the State of Washington. At the same time, the number of actual or potential hazardous waste sites were identified.

This work by EPA, NOAA, and the State department of environment was instrumental in the designation last year of Commencement Bay and associated shoreline areas as a high priority Super Fund site under that legislation.

Since that time, a significant amount of investigation and regulatory activity has taken place. In fact, we have spent well over $1 million-plus in the last 12 months just in Commencement Bay alone.

The EPA has initiated field investigations to determine the extent and possible source of contaminated groundwater in the South Tacoma area. We have concluded that this contaminated groundwater source is not a pollutant source for Commencement Bay.

Several companies, though, have agreed to voluntarily investigate and clean up past practices.

We have recently completed preliminary sampling of sediments in the deepwater portion of the bay; we expect these results will be available in the next 60 days.

We have proposed to the Corps of Engineers a process for disposal of clean dredge spoils in areas which we call hot spots, which would "cap" these hot spots. This would be done under the Corps of Engineers' maintenance dredging responsibilities.

Our objective in the next year is to develop sufficient data to pinpoint where this "capping" will help and evaluate whether such practice is an effective longer range solution.

While our Super Fund activity has been focused in Tacoma, other approaches have been used in the Seattle area. EPA has provided a significant amount of money to Metro to work in this particular area, looking for both source and nonpoint source toxic discharges.

For example, we provided $67,000 for a pollutant inventory in the lower Duwamish: $40,000 for a survey of household hazardous wastes and options for their disposal; and $3.5 million for a toxic pretreatment study.

Most of this work by Metro is nearing completion. Recently, my staff conducted a survey in the Duwamish to obtain additional data on chemical contamination in the sediments. This work and other surveys which follow will complement the investigations of Metro and by DOE and NOAA.

Taken collectively, the results will provide a better basis for controlling current and future discharges of toxics in the Seattle area.

In addition to the items that I have just described, EPA has most recently initiated a significant effort to address both the localized problems in the urban/industrial embayments and the longer term cumulative effects questions, which I raised awhile ago.

In response to the recent discovery that the problems of fish abnormalities in the Everett Harbor area are even more severe than in Tacoma, EPA in cooperation with the State, is involved in a number of actions to address that problem.

I should say I also know that we borrowed one of their boats some time ago to map the Bay with sonar-type equipment. These other actions are as follows: EPA is analyzing fish samples collected by the DOE in the Everettt area to provide additional data on the nature and extent of fish contamination.

Our initial results I will leave to the other John Spencer, since he just has some information that just came in today. This work, and additional investigations that will probably follow, will complement that work done by NOAA to date.

EPA, the State department of ecology, and several of the major industries located on the Everett waterfront jointly completed a survey of sediment contamination in the harbor area. The field work on this survey was completed last week, and as a result should be available in 60 to 90 days.

These analyses will give us some idea as to whether or not the problem is due to residuals from past practices.

Samples of current permitted discharges into the inner harbor area have been taken by the department of ecology and are being analyzed at EPA's Manchester Lab for a wide variety of toxic contaminants. This information will assist in identifying any additional controls which need to be added to current discharge permits. Some of these permits have expired and are to be rewritten in the near future.

We are reviewing all available information regarding actual or potential hazardous dumping in the Everett area to see if we have missed anything in previous screens.

A number of actions have been taken or are planned to address both localized and cumulative effects in the total Puget Sound area.

The question of health effects due to consumption of contaminated fish is arising in many areas of the Sound. Agencies of all levels are asked to respond to inquiries on this problem.

EPA recently hosted a meeting of representatives from selected local, State, and Federal health agencies, NOAA, and department of ecology to review all the available information on fish contamination.

The intent of this meeting was to see if any common position of these agencies was agreeable. It was agreed that a coordinated strategy involving both health agencies and environmental agencies is needed. A followup meeting is scheduled for mid-November.

It is becoming increasingly apparent that any urban or industrialized area on Puget Sound is likely to have problems with chemical contamination, fish disease, and so on and so forth.

The regulatory agencies, EPA and DOE and others, do not have the resources to address all of the problems concurrently. EPA and DOE staff have been meeting to establish a comprehensive priority list of these actual or potential areas.

This listing will be used by EPA and DOE as a basis for future investigative and regulatory work.

Both of these agencies have initiated a program to look at the localized problem and the overall cumulative impact. DOE has the lead in this effort and will discuss it more fully in their testimony.

EPA's region X is heavily involved primarily from a financial standpoint as well as staff. To this date, we have received $500,000, and actually, Senator, I contribute that to one of my friends, a counterpart in Philadelphia who gratuitously gave it to us after our need was known. And we're going to use that in addition to other money that we have.

The information, action plan, and management and coordination structure which evolve during this effort will hopefully provide a sound basis for dealing with the long-term problem of toxic contaminates in Puget Sound.

The problem of toxic contamination in Puget Sound is probably the most difficult environmental control problem faced by any of these agencies or any agency participating in this hearing.

The area is large and complex, and the government agencies and authorities are varied and complex. It is, and will be, a very difficult problem to solve.

I am optimistic, however, that by working together, these agencies can, over the long term, resolve this problem and maintain the environmental quality vitally necessary to Puget Sound and the surrounding area.

In my testimony, I have tried to indicate that much progress has been done over the last 20 years and much work is to be done and is currently underway. EPA is strongly committed to carry out its responsibility and to support the other agencies in carrying out theirs. Collectively, we will get the job done. If I, or any members of my staff can answer any questions, we will be happy to do so.

Senator GORTON. We'll hear from the State.

STATEMENT OF JOHN F. SPENCER, DEPUTY DIRECTOR, WASHINGTON STATE DEPARTMENT OF ECOLOGY

Mr. JOHN F. SPENCER. I am John F. Spencer with the State department of ecology, and although John R. claims to be a little younger than I, I did notice he is using speech type much larger than mine.

On behalf of Governor Spellman and Donald Moos, our director, I am pleased to be here and I appreciate this hearing, Senator.

John R. Spencer has presented a comprehensive report about the Environmental Protection Agency's role in controlling toxic chemical pollution. We are very pleased with the actions that EPA has taken and the joint efforts that we have been able to initiate in dealing with chemical contamination in the Sound.

My testimony has been given to you to read, but I will summarize it now and give you the results of our latest monitoring within Everett Harbor.

By way of some background, I think it's interesting to note that almost 20 years ago, the first major effort to clean our Puget Sound water was initiated. The Federal Water Pollution Control Administration, now EPA, and the State water pollution control department, now the State department of ecology, the State department of health, and local health agencies joined in this effort.

They developed a Washington State enforcement project. The objective was to evaluate the impact on the fisheries resources from the pulp and paper mill waste discharged into Puget Sound. In the 1962 project, four marine water areas were studied: Bellingham Bay, Everett Harbor, Anacortes, and Port Angeles.

The study specifically investigated water quality. But one of the principal findings which reflects today's Puget Sound concerns included this quote: "Bottom sludge from solids in the effluent contained toxic components harmful to fisheries resources."

That single statement brings us to where we are today. Today, we are adjusting to the cumulative effects from toxic chemical pollution in the Puget Sound.

We are going beyond the water column and into the sediments which cover our marine areas. Now, when we received the National Oceanic and Atmospheric Administration findings on Everett Harbor, we were very concerned about environmental quality and public health.

Upon receiving the information from NOAA, we joined EPA to collect more samples in a broader area of the harbor. These samples were analyzed in the EPA Lab, and the results are being provided for local health authorities today.

We established five sampling locations at areas known to be popular fishing areas. Samples of English sole and rock sole were taken at each location and analyzed for priority pollutants. This was done to understand the public health risks in consuming these fish.

Our conclusions are as follows:

One, close visual observation of 26 fish collected at 5 locations reveals 3.9-percent external abnormalities. Internally, possibly the most observable abnormal condition was discoloration of the liver, the meaning of which is still being investigated.

Deformed fin rates were not observed as reported by Malins. But the possibility of deformed fin rates is still being investigated. No histopathological examination of cellular and subcellular structure was done as was done by Malins.

It would seem, then, that for the consumer fishermen, the English sole and rock sole would appear healthy and probably not be discarded as unfit to eat.

Two, metal concentrations in the filet tissue is generally less than one-tenth the applicable FDA administrative guidelines for edible tissue. It should be noted that guidelines exist only for cadmium, mercury, and lead. Administrative guidelines do not exist for most metals.

Three, there is no significant difference between tissue metal concentrations of fish collected at any of the five stations. We were inside the harbor as well as outside the harbor.

Four, the bioaccumulation of metals in liver tissue is generally much higher than in filet tissue by as much as 1,000 percent in some cases.

Five, of the 114 priority pollutants, only 14 compounds were found in either the liver, the filet, or both. Other compounds did exist, but procedural inadequacies for further detection levels would not allow their identification or quantification.

Six, organic pollutants are all below the applicable administrative guidelines and also below the applicable World Health Organization and daily intake levels.

Again, that is in the filet tissue.

It should be noted that guidelines do not exist for many organic pollutants, and many chemicals in the samples could not be identified or quantified.

Seven, there was no significantly serious difference in organic pollution contamination of fish in any of the five stations. It should again be noted that identification and quantification problems exist.

Eight, Everett English sole and rock sole have a lower chlorinated pesticide and PCB concentration than similar organisms in most other industrialized and some unindustrialized areas of the Puget Sound.

Let me speak a little bit about the current data. There are many efforts now to deal with toxic pollution in Puget Sound. A principal concern is that our efforts not be fragmented among the various public agencies involved. We have taken the proper and orderly initial step to study and solve the problem. It has been a cooperative effort, and each agency is presently making an important contribution with knowledge and techniques toward a common goal of correcting this problem.

Let me briefly describe the programs we are involved in. In fiscal 1982 the Department of Ecology, with EPA funding, initiated the Puget Sound sensitive area study. This study was designed to provide a short-term, water-quality management for Puget Sound.

This will include the identification of areas of Puget Sound which, due to the hydrographic characteristics and beneficial uses are sensitive to pollutant loading.

We will also provide input into the decision process of waivers of secondary treatment requirements from municipal discharges under section 301H of the Clean Water Act. This effort is being coordinated with our increased Shellfish Protection Act and will be integrated with the long term cumulative effects study.

Because of the importance of the economy and recreational pursuits of the people in Washington, the DOE has put shellfish protection into a top priority program for the use of a portion of section 205J fund. In mid-November we'll hold public workshops to discuss guidelines and priorities for using these Federal funds.

We'll combine them with what we receive from NOAA and through the shellfish program for the sound.

As you can see, there are many related efforts to control pollution in Puget Sound. Therefore, a DOE-EPA joint management program has been established to focus our resources on correcting problems and preventing future problems.

Our joint management contract with EPA will focus on, one, conducting cumulative effects studies; two, developing an ongoing monitoring strategy; three, identifying other areas that need investigation; and four, coordinating of monitoring, investigative and enforcement activities.

The catalyst to bring the agencies together will be an intergovernmental personnel agreement. We have engaged an EPA manager to work for us. This individual will head the joint management team to direct our Puget Sound program.

Looking to the future, it is clear we will need NOAA's research. However, it should not be completely independent of pollution control and investigation. It needs to be a more comprehensive program of investigation and research.

This type of work is far too extensive not to be integrated. There are important questions that NOAA research may help to answer, such as which compounds cause which abnormalities in fish; what are the migratory patterns of bottom fish; and the degree of damage to the marine resources.

Such research would assist public health agencies in avoiding risk in bottom fish consumption. At the same time the sampling analysis could be a great help to us to locate the sources of contamination and point to possible remedies.

Our biggest problem will be cleaning up some past practices of waste disposal. In some cases these practices are documented, and we can find the disposal sites and their contributors.

Unfortunately, I am sure we will uncover areas where we have no documentation and our investigative capabilities will be pressed hard to provide solutions.

Many of the past discharges were in compliance with the law at the time. As the state of the art of chemical detection and analysis advanced, the more stringent limits have been incorporated into discharge permits.

This makes me reasonably confident that through Resource Conservation Recovery Act and Clean Water Act and the Clean Acts and the comprehensive environmental response, Compensation and Liability Act, and State programs, we will be able to control current and future sources of chemical contamination in the sound.

Eliminating the problems from past practices will be more difficult and will test the administration of those laws. I only ask that these laws not be weakened by an amendment or inadequate funding.

Let me conclude by saying that our success will depend largely on the cooperation of all agencies as we undertake this task. The lesson that was learned in 1962 are applicable here.

We see the total Puget Sound management issue as round two. However, we are much further ahead of the pioneering effort of 20 years ago.

The joint EPA–DOE management team has been formed, and there is a spirit of cooperation and a willingness between the agencies involved.

Thank you very much for this time today.

Senator GORTON. John, you gave us the results of a study which has just been completed today.

Mr. JOHN F. SPENCER. Yes.

Senator GORTON. No one has seen it before?

Mr. JOHN F. SPENCER. No, they haven't.

Senator GORTON. Can I ask you to translate those rather complicated results into normal, everyday English? Were you telling us that there wasn't any problem, that the problem was smaller, perhaps, than you had feared? The bottom line is: Would you have been perfectly willing to fillet and eat those sole?

Mr. JOHN F. SPENCER. I'm not a health officer, but I'd risk answering those questions from my judgment on the question. It appears that eating the fillet which we normally eat when we catch the fish would not present a health hazard, if they're eaten in portions that people normally eat them.

I would be very cautious about eating very large amounts of fillet or having a daily diet of the fillet. Obviously, the liver is very contaminated. They've been accumulating these chemicals and metals and should not be eaten. So make your judgment on the health aspect of it.

The other thing that was interesting to us is that the samples from the inner harbor sampling, even to Gedney Island, showed no significant differences in the levels of contamination that we found.

Now, this either has to do with—well, I think it has to do with the migratory habitats and age characteristics of the fish.

Senator GORTON. So, at least in that immediate area, it didn't matter where you went fishing?

Mr. JOHN F. SPENCER. That's right. It didn't matter.

Senator GORTON. I have a question for both of you. Do you feel there is far less toxic chemical discharges at the present time than there was even 2, 5, or 10 years ago, and that in that respect we have a manageable problem? Do you know what the present sources are?

Mr. JOHN F. SPENCER. Quickly, I'll answer and then let John respond. My impression and my opinion is that we have drastically reduced the amount of pollutants going into the harbor and we have also reduced the amout of chemical contaminants going into the harbor.

Second, we know the point sources, and so I believe that the control of existing discharges is manageable.

And third, our problem was in dealing with past practices.

John.

Mr. JOHN R. SPENCER. Senator, I have to parrot John's comments there. It wasn't many years ago that the pulp and paper industry, for example, simply discharged through an outfall into the sound at various places. They do that in other parts of the world, Even north of us today.

We have required through extensive regulation and statute that Congress has passed, known as the best available technology to be utilized by these plants, and they all have it to the tune of well over $100 million. You ask them, they'll tell you probably closer to $200, but we think the $100 million, which has reduced the biochemical oxygen demand (BOD) by 96 percent. That's a measurable kind of quantified number I can give you.

Other discharges, likewise, are regulated by different effluent guidelines which have been published by the EPA, and currently have been translated into permits issued by the State of Washington.

So, not only do we have those limitations by regulation, we also have a serious monitoring situation going on hand in hand with it, so we know when they are in violation. We know when they have an upset. We know what's going in there.

The areas of concern that we have are still nonpoint source discharges. This is the urban runoff, if you will, stuff that goes into a storm sewer and subsequently goes into the Puget Sound area. Metro will testify later as doing a tremendous amount of work. I know they are, but they are doing it because we paid for it and we're getting reports back from them relative to the toxicity of all the waters going into—known point source water—going into Elliot Bay, for example.

So we can give you a better idea of what's going in. So not only do we think that the control over the effluent and of the waterways is reduced immensely, we also know more of what going in there and can follow that.

And I am not a scientist, any more than the other John Spencer, but we certainly have a lot of scientists at work for us and tell us that the effluent discharges are down from a toxicity point of view immensely.

So, we're looking at what happened there before. What is in the bottom of the bay that might be causing some kind of an abnormality to the fish. And so, we have concluded—at least, EPA region X and DOE, at this point in time—that the primary problem is past practice, which may well not have been illegal, but there wasn't any regulation on it in those days.

Back when we got the lab over in Manchester, thanks to Representative Dicks here, and Senator Magnuson, and that was—a very good example. That was done. That was given to us.

You can probably speak much better than I can on this. It was given to us because of this very problem, the toxicity of Puget Sound. We put it over there right on the bay because of this issue. I'd have to say we are now looking at the sediments, the problem in the bottom because of past practices.

If we clean it up, we dredge it up, you cap it. What do you do with it? Where is it? Believe we, we are so sophisticated between NOAA and Dr. O'Neal back here, they can take a boat out with sonar and this other kind of equipment on it and tell you how deep it is, what the compaction of that stuff is, and get a very good idea of what's down there when they take samples.

We think that's the problem. Still urbanized runoff from nonpoint sources.

Congressman Dicks. Mr. Spencer, I appreciate your reference to the EPA lab. As you know, I have been deeply concerned about the pace of the program in terms of the cleanup in the Commencement Bay area. And not just in Commencement Bay, but the land sites that may be contaminating the water supply of Tacoma. And in fact, as you know, several wells have been shut down. The point I want to make to you today is, we are trying to look for constructive answers.

We are trying to find solutions here.I don't want to come here and beat up on you, but I do hope that you understand that we are committed to try to deal with this problem in a near-term timeframe.

What I have been worried about is the bureaucratic problems that have existed. For example, there was a question of whether $7 million of State and local money that had been spent on these efforts in the past could be used as local match under the Superfund program.

And, you know, what worries me is that, Congress provided the Superfund so that you at the EPA would use those resources, 85 percent of which come from the chemical companies in the form of a tax, to aggressively enforce the law, to go out there and clean up dump sites that exist, and to enforce the law as to people who are continuing to let these chemicals get into Puget Sound.

What I worry about is that there has been kind of and overemphasis on studies—if we're going to study it we're going to be bureaucratic about it, rather than making real effort to get in and deal with the problem.

Congress has given you a mandate. It has given you the money. I'd just like to get your comment on this. Does it have to take this long to go in and look at the—particularly the land chemical sites. I understand the problem in Puget Sound is very difficult.

The only reason we're on the top 10 of the country on the major list is because of the threat to the water supply of Tacoma. That's what distinguishes us from Seattle and Everett and other areas.

I think our problem out in the bays is about the same. Ours may be a little unique because of chemical dumping, but it's a threat to the water supply that put us in the top 10 of the country.

And I just want you to know, and I've talked to the other John Spencer until I'm blue in the face. I think everybody wants to do it, but if EPA can't do this because we don't have a local match, and we can't do that because we can't do this.

And I get very, very frustrated, and I'd just like to see some direct specific action to really tackle this problem, because I think that's what people want.

Mr. JOHN R. SPENCER. I take it that was almost a rhetorical kind of question.

Congressman DICKS. You are right.

Mr. JOHN R. SPENCER. I am going to answer your rhetorical question, because I feel very much like you do.

There is nothing worse than when you talk about Chesapeake Bay—they have Chesapeake Bay studies that have gone on for 7½ years so far. Great Lakes studies have gone on for, what, 20 years so far.

And the last thing in the world we want to do here is to have—all the scientists here will have to excuse this poor lawyer. I don't want this to become a scientific approach as much as I want to clean the damn thing up.

Congressman DICKS. I remember when the Puget Sound Congress was held in 1962.

Mr. JOHN R. SPENCER. I know. I know. Twenty years ago, at one point in time I asked the manager of my utilities up in Anchorage why it took so long for these kind of things to happen. He said, "Well, they took the scientists out of the program to put a man on the Moon, because as soon as they found out they got him on the Moon, the program was over. And they lost the money. So they never will figure out how to do the next thing."

There's probably more scientists than lawyers here, but the bottom line is I have gone way, way, way over my limit. We spent a million dollars down there so far without a match. And I've done that out of every conceivable fund I could find.

Congressman LOWRY. Be creative. Lawyers are creative.

Mr. JOHN R. SPENCER. Very creative, and probably going to get in very much trouble for that. Because you're not allowed to spend money that's not appropriated for that particular purpose.

But I've done it on the basis that we're going to get the money. We have this audit of the money that DOE has spent so far. All I can tell you, Congressman, is we—and I say we collectively, because it was a lot of people's good efforts to put it on there to use the funds—we went out on a limb and we told the people in your district and in my area that Commencement Bay was one of the top 10 areas in the country on hazardous waste.

And that means uplands, tidelands——

Congressman DICKS. The port area, waterways——

Mr. JOHN R. SPENCER. The whole thing. And if we don't do something, I think we'll really miss the boat, and we are. And I'm doing it without the match funds at this point, hoping that it's going to come.

Congressman DICKS. Well, we know the State's got serious financial problems. One other point, and I'll let the others go, because we're short on time. I don't believe we're going to get those companies to really deal with this on a voluntary basis.

Down in that port area where we still have an ongoing problem, I think it's incumbent upon EPA and the State to forget volunteerism and start enforcing the law.

There is a conception in this country today that EPA is taking kind of an offhand approach to these issues. And believe me, I don't think that's what the American people want. I know it's not what the people of this State want.

They want the laws of this State enforced and not just volunteerism.

Mr. JOHN R. SPENCER. We are getting some good support from Burlington Northern, and others have been very supportive. I was just accused the other day, Congressman, of being overenforcing. We have about 300 percent higher enforcement in this area right now than we had 2 years ago.

And so, someone accused me of being too tough. But we're down there, we're working on that. The law says they have to be given an opportunity to volunteer, which we've done.

In many areas they have just thumbed their nose at us and said, "We're moving on." That's the way it is.

Congressman DICKS. Thank you.

Senator GORTON. Congressman Lowry.

Congressman LOWRY. Thank you. And I know you want to keep this short so we can get to the rest of the witnesses, so I may submit questions especially on that report that I have some problems with. It's my understanding that the State must provide a 50 percent match. Is this correct, John?

Mr. JOHN F. SPENCER. Yes, that's correct.

Congressman LOWRY. What are the plans of having that 50-percent match?

Mr. JOHN F. SPENCER. We are submitting legislation through the Governors' office that we hope will go to the legislature to establish a way of coming up with the 50-percent match. The match money that we need is now to match the studies and investigations that EPA is conducting. They have proceeded on most of the studies without the match.

The big question will be the cleanup money. And that's where the large dollars will be, and that's what we'll be addressing to our legislature. That there's no mystery about it. We do not have that kind of match money today, and we'll be submitting a request for it.

Congressman LOWRY. To this next legislature?

Mr. JOHN F. SPENCER. Right.

Congressman LOWRY. EPA John, do you have a staff to handle the secondary waiver applications that region X is now handling?

Mr. JOHN R. SPENCER. First, we don't have that authority yet and second, we don't have the staff.

Congressman Lowry. Well, how many waiver applications are there. This year for instance.

Mr. John R. Spencer. I don't know, Congressman. There are over 70, and we have the lion's share of them. We have Alaska, Washington, and all that. Predominantly Alaska.

Congressman Lowry. Is the EPA Office in Washington, D.C., going to provide the staff for that responsibility? Are they going to give you the responsibility and not the staff?

Mr. John R. Spencer. As of last week, Mrs. Gorsuch said we were going to have the staff. So, I brought that issue up to her personally.

Congressman Lowry. Thank you.

Senator Gorton. Congressman Pritchard.

Congressman Pritchard. We don't want to pick on you people, but we're anxious to help, and we want to be supportive. We're not unmindful of progress that's been made and a lot of effort by a lot of people, and some of us who have been involved in these things over a number of years see a lot of progress.

I guess we're just terribly anxious about it, and we want to be supportive where we can to get you the tools and the backup so this job gets done. That's all.

Senator Gorton. Thank you both.

The third panel consists of Mr. Chase, Ms. Matthews, and Mr. Frank.

Mr. Chase, you may proceed.

STATEMENT OF STEPHEN L. CHASE, EXECUTIVE DIRECTOR, NORTHWEST FISHERIES ASSOCIATION

Mr. Chase. My name is Stephen Chase. I am executive director of Northwest Fisheries Association, a trade association of seafood processors in Washington and Alaska. For 35 years I operated the filleting plant on the Everett waterfront.

Our concern in these hearings is the damage done to the image of seafood. I was at a United Nations dinner last week, and the lady next to me, previously unknown, asked if I had been reading about the way the fish are polluting our waterways in Puget Sound. Many of you are familiar with the cartoon in the Seattle Post-Intelligencer which appeared in conjunction with the reporting of Dr. Malins' findings and which I've reproduced on the wall, showing a fishmonger, if you please, dressed as an atomic cleanup man, and the signs indicate that he has sole and salmon, tuna and oysters for sale.

I believe most in this room recognize this cartoon and some of the headlines suggesting similar horrors are contrary to the testimony of the scientists which we've heard here today.

Dr. William Aaron, who is director of NOAA Laboratory sponsoring these studies, on September 28 of this year, wrote the editor of the Seattle Post-Intelligencer a letter from which I quote:

> English Sole and all other fish species examined which were caught in areas of Puget Sound away from these urban embayments are essentially healthy and highly edible fish. I wish to emphasize that the commercial fishing areas of Puget Sound are not in the highly polluted urban waterways and industrial estuaries. To sum up the situation, absolutely no evidence exists that these problems occur with fish and shellfish sold through commercial markets. These commercially marketed species, including English Sole, are obtained primarily from areas removed from known portions of pollution. All evidence reaffirms, therefore,

the commercially marketed fish are safe to eat and remain a well-balanced and rich source of protein and other nutrients.

Also, Dr. Thomas English of the University of Washington oceanography department has made an indepth study covering 3 years of work on the commercial fisheries in Port Gardner Bay, and I quote from his categorical statement:

> The appearance of fish taken in Port Garner was similar to healthy fish taken elsewhere in Puget Sound.

To further emphasize the difference between the embayment studies by NOAA and the commercial fishing areas of Everett—I would like to use this chart, if I may, Mr. Chairman——

Senator Gorton. Certainly. Go ahead.

Mr. Chase. These are the areas, as I interpret the map provided by the Government where the studies that brought on this meeting were held. This is the closest sole fishing area, and from the innermost harbor to here is over a mile from the furthermost area where there was sampling to here is 1,000 yards. This is the commercial crab fishery part of it in Port Gardner Bay.

And I should emphasize that in further distances there are areas where they fish crab. But these are the closest.

So, you can see we are talking about different areas.

Also, I would plead that as I interpret Dr. Malins' testimony, that when they moved away from this area in their most recent studies, the percentage of fish with the deformed livers dropped very precipitously.

Very large sums are spent to improve the image of seafood. As one example, the Alaska Seafood Marketing Institute has approximated almost $7 million for promotion for next year.

And you can appreciate what a burden it is for our industry to be set by difficulties to come up with these huge sums which are essential to our marketing.

It is crushing for the people who have worked diligently on these programs to see their work negated by unfortunate and erroneous publicity. We trust that your committee participating in these deliberations, as well as the media, will emphasize that the high quality of Puget Sound commercially caught seafood has not been questioned in Dr. Malins' studies.

The pollution situation in Everett Harbor has vastly improved. I was a commercial fisherman during the Great War, and at that time you couldn't see objects 2 feet below the surface of the water.

Now, I'm a sports fisherman, and when the river is not high and heavily silted, we frequently see our pots on the bottom 12 to 18 feet down, and we can see the crabs moving in the pots.

During the past decade, the citizens and industries of Everett have spent $100 million to improve the water quality of Port Gardner Bay, including two major projects by Scott, two by Weyershaeuser, and the city of Everett's sewer lagoon.

We in the seafood industry recognize and salute the progress being made and the jobs being supported.

Thank you.

Senator Gorton. Thank you, Mr. Chase. Excellent testimony. Ms. Llewellyn Matthews.

STATEMENT OF A. LLEWELLYN MATTHEWS, NORTHWEST PULP AND PAPER ASSOCIATION

Ms. MATTHEWS. My name is Llewellyn Matthews. I'm with the Northwest Pulp and Paper Association.

The Northwest Pulp and Paper Association, which represents the majority of pulp and paper in the Northwest, is particularly concerned with the issue of toxic chemical pollution, as six of our member mills are located in the Puget Sound area. The pulp and paper industry is most anxious to add any information which we possess about our processes, our pollution control efforts, and our capabilities as well as our industry research findings which may be helpful to your inquiry.

The subject of toxic effects in any context tends to generate a great deal of emotionalism and pressure to do something to find quick and easy answers. This reaction is further compounded when an important resource such as the Puget Sound is potentially affected.

The pulp and paper industry urges this committee to proceed very cautiously into its inquiry of this issue. In our view, it is critical that scientists, regulators, and the regulated community develop a firm understanding of what the causes and what the effects are. We stand ready to give any technical assistance that we can contribute to these efforts.

The pulp and paper industry's recent experience with just one chemical substance studied in one research study illustrates the complexity of the problem.

The recent NOAA study has received much attention locally. The study found a high rate of liver lesions on English sole caught in the urban harbors of Puget Sound. The highest rate was found in Everett Harbor. These findings are based on preliminary studies which indicate that many factors could be responsible, including the chemical retene, which is presumed to be associated with the pulp and paper industry. Retene is not one of the four major chemical groups that cited earlier. It is also not a priority pollutant but is thought by some to be a tracer for pulp and paper effluent.

These findings place the pulp and paper industry in a considerable dilemma, because so little is conclusively known about the sources of this chemical and what its potential effects are. I'd like to go over some of the areas of uncertainty in this area.

First, the English sole, as any creature which lives in close proximity to the sediments or urban harbors, may be especially affected by pollution loading of the sediments. However, the use of the various species of bottom fish as indicators of pollution is problematical, as these species tend to show a high rate of organ and skin lesions of many types even in the pristine areas. This phenomenon has been documented in a considerable number of fish species over the last 40 years. Some of the earlier studies go back to the turn of the century. English sole, for example, has been known to show as high as 43 percent rate of skin lesions and Pacific cod as high as 100 percent both in pristine waters.

In addition to possible causes associated with pollution, other factors are also suspected of causing a high rate of lesions. These include such things as viruses, parasites, the physiological stresses associated with changes in the life stages of the fish. So, there are many possibilities in addition to pollution that would give you this type of phenomenon.

The second major area of complexity involves the pathways by which retene could be deposited in the Puget Sound sediments. They're not very well known, but there appear to be several natural pathways other than as a direct result of the pulp mill effluent.

It is possible that retene will be found wherever there is exposure to water and wood, and we have a lot of that in the Northwest. All soft wood contains some resin acids which are potential precursors of retene, and which may leach whenever wood comes in contact with water. There are also recent studies which identify retene in conifer forest soils, and it may be expected to enter the marine environment through erosion.

For example, naturally high levels of retene have been found in the Columbia River sediments up above the points where the pulp mill effluent would enter the system.

Despite the possibility that retene may be entering the environment through natural pathways, the pulp and paper industry has initiated efforts to determine to what extent retene may be found in our effluent. The results are not complete. However, there are some preliminary analyses by the department of ecology which indicates there may be as little as a couple of tenths of parts per billion, of retene found in the effluent of one Puget Sound pulp mill. This is at or near the limits of detection of the analytical equipment and is an amount which the State considers to be insignificant.

Also, there is some work reported in the South and Southeast on the effluent of mills which use southern pine which contains more resin acid precursors than Northwest woods such as Douglas fir and hemlock. These mills show only slightly higher levels of retene but are still in the range of possibly being insignificant.

By comparison, there are ongoing studies indicating the background levels of this chemical in Puget Sound sediments range anywhere from 50 to 250 parts per billion. The possibility of natural pathways of retene into the environment, along with preliminary findings of high background levels, indicates that this chemical may be a poor tracer for the pulp mill effluent.

A third major area of concern involves biological effects of retene. Retene has been recommended for study to determine if it is carcinogenic, but the studies are not complete.

The pulp and paper industry, however, has sponsored research in artificially created cold and warm water streams to determine the effects of our effluent on fish. Stream fish exposed for up to 10 months in water which averaged 10 percent pulp mill effluent did not show any lesions even at levels of exposure which far exceed, which a fish would encounter in the vicinity of a pulp mill naturally.

Since 1977, the pulp and paper industry has been required to control its major pollutants, consisting of toxic substances. Since the installation of required pollutant systems, Puget Sound mills have been in compliance with all Federal and State requirements. No control of retene has been required, because state-of-the-art analytical techniques have not shown it to be generally present in quantities which are significant to the environment.

The experience of one industry with one chemical tentatively identified in one preliminary study which has been receiving wide attention locally, is a small part of the picture. We think our story would be multiplied by as many industries and as many chemicals as are known to be present.

I hope this account is helpful in illustrating an important message, and mainly that the magnitude of the problem we have and the uncertainties of identifying the exact cause and effect.

The pulp and paper industry is continuing its efforts to help resolve these uncertainties. It is prepared to work with researchers and environmental or health agencies to assure any real toxicity problems are responsibly dealt with.

Thank you.

Senator GORTON. Thank you.

You are Ms. Dennis? Would you state your full name and your association for the record, please?

STATEMENT OF ELSIE DENNIS, INFORMATION SERVICE OFFICER, NORTHWEST INDIAN FISHERIES COMMISSION

Ms. DENNIS. Good afternoon. My name is Elsie Dennis. I am the information service manager for the Northwest Indian Fisheries Commission. Mr. Frank sends his apologies for not being able to be present today.

I think the environment is something we can all agree on. I remember about 1 year ago there was another hearing that was quite vocal and volatile. But the environment is something that the Indians and the non-Indians can stand together on and agree upon.

We all want clean water. We all agree on clean water.

The estuaries of Puget Sound are important for salmon. We have chosen to address the salmon in particular.

Puget Sound serves as a feeding area and a rearing area for salmon and steelhead. The tribes do have some responsibility as resource managers to serve as caretakers of the salmon and steelhead.

Many of our concerns have been addressed today. We do see that there are many studies going on in DOE and NOAA. Some of the local community health agencies are conducting their own studies, and we would like to see these coordinated.

I guess today's hearing shows that we do have a choice in all of this. We don't have to become like the east coast. There are things that we can do. That is the tribes' primary concern, that we do work now together.

Thank you.

Senator GORTON. Ms. Matthews, my impression of this panel is that you all must be doing something right, because in all the years that I have been involved in politics, I have never heard anyone representing commercial fishermen say as nice things as Mr. Chase said about you today.

Ms. MATTHEWS. Thank you.

Senator GORTON. And I think that's my primary comment, in this respect, that so many varying groups in the private sector share the same goal and are concerned that we reach those goals is a very encouraging sign.

And Ms. Dennis, I'd like to ask you one question of a general nature. In Mr. Frank's written testimony, which will be made a part of the record, he speaks of the necessity for congressional action to protect water quality. And as you know, the Clean Water Act is now up for authorization.

Can you tell me whether or not any of the tribes individually or your Commission are going to make specific recommendations to Congress in connection with the renewal of the Clean Water Act? Will you be prepared to do that?

Ms. DENNIS. No; but we can send that if we are requested to do so.

Senator GORTON. Because of this concern of Mr. Frank's, it is important for you to know that this is the time in which action is to be taken. If you do have suggestions that should be communicated to Congress, do so relatively soon. Congressman Lowry?

Congressman LOWRY. Thank you. I want to compliment this panel. All three have made excellent statements. Ms. Matthews, I think I heard all the way through your statement the uncertainty as to what are the effects, what are the causes, and how bad are these effects.

Is it public policy of your organization to support increased studies by NOAA, the studies on line, to support increased Government studies on those public studies?

Ms. MATTHEWS. This issue is a unique one, and with respect to this issue, we have a specific policy which is to support it and to help in any way that we can in terms of providing our research, our data—whatever may be helpful.

Congressman LOWRY. So that obviously would include supporting increased appropriations for NOAA and those type Government operations?

Ms. MATTHEWS. Yes.

Congressman LOWRY. Thank you. I think that's a very responsible position for you to be taking. No further questions.

Senator GORTON. Congressman Pritchard?

Congressman PRITCHARD. I suppose what you are stressing here is that you are fearful that conclusions will be drawn before they have all the facts. Does that boil it all down to one sentence?

Ms. MATTHEWS. That would do very nicely.

Congressman PRITCHARD. Well, I think all of us want as much information as possible, and I think that we want to be very careful. We don't want to make any quick judgment.

But this thing does call for some very, very complete studies, and I would assure you that I think I can speak for all the members here, we're as anxious to get complete information as possible.

I don't think we want to go off on any partial amount of information in drawing our conclusions. So, I think we understand what you're talking about.

We're not contrary to your wishes of getting all the information. I think you come to some point in these cases, however, where you never have everything, and there is still some area there where you have to make some judgments.

You can't be dead certain, of course; we're dealing with health standards, and these things can have very long-term effects. I'd just like to say to the gentlemen that I know what you mean by bad publicity.

We all remember what happened to the cranberry industry. It takes a long time to come back to the marketplace.

If you did some publicity about some type of fish, that's just something we have to hope that the media do an accurate job of reporting. I don't think we're in trouble if we have accurate reporting. This is our feeling.

I appreciate your statement.

Senator GORTON. One carton can take care of an awful lot of advertising.

I should like to thank you.

I should like to proceed to the fourth and last panel with Mr. Wimmer, Dr. Nicola, Mr. Lampe, and Professor Duxbury. If they will come forward, and they will speak in that order.

Mr. Wimmer, you're first on my list.

STATEMENT OF THOMAS O. WIMMER, WASHINGTON ENVIRONMENTAL COUNCIL AND CITIZENS COMMITTEE FOR CLEAN WATER

Mr. WIMMER. My name is Thomas O. Wimmer, and I live at 7756 Seward Park Avenue South, Seattle. I am speaking for the Washington Environmental Council and for the Citizens' Committee for Clean Water.

We are pleased that you and your colleagues in Congress are concerned with the health of Puget Sound. It very definitely needs a different diet, if an 11th hour disaster is to be avoided.

Nobody should be surprised that the 11th hour has arrived. It was predicted in the widely reviewed and publicly discussed environmental impact statement. I am referring to the September 1977 EIS prepared jointly by EPA, the Washington Department of Ecology, and our own METRO.

It told what was happening with METRO's primary sewage effluent when it is discharged into Puget Sound opposite Seattle and shorelands. It was very alarming.

Here is an example of our concerns, and I quote:

> Shellfish have long been implicated as carriers of typhoid fever and other enteric diseases, plus infectious hepatitis. Viruses that have been shown to enter the marine food chain include edible species of fish and shellfish, in addition pathogens absorbed into particles which settle fairly rapidly are not quickly killed, but remain infectious for long periods of time.
>
> Violations—of coliform effluent limitations—occur most frequently in the shoreline vicinity of outfalls from Carkeek Park, West Point, and Alki.
>
> Virtually all the METRO Puget Sound beach and offshore stations failed to meet the State fecal coliform standards for commercial shellfish waters in 1976.
>
> This suggests that consumers of shellfish dug on beaches in the METRO area are exposed to greater risk of disease than is allowed for commercial shellfish.

In addition to this very obvious red flag, we have furnished some of our elected officials in the METRO Council 15 additional omnibus abstracts from the September 1977 EIS, and not only once, but several times in the past 5 years.

The thrust of our activism was to have METRO implement their preferred facility plan, and its configuration is recommended by METRO's executive director, Mr. Neil Peterson in August 1978. But with all plants except West Point upgraded to secondary. Secondary treatment would remove an additional 30 to 35 percent of the sewage solids and with it about the same amount of toxins and heavy metals known to be attached to those solids. But upgrading did not take place.

Instead, METRO obtained or are seeking waivers for secondary treatment for its primary plants discharging into Puget Sound.

Additionally, METRO abandoned the well-thought-over configuration of August 1978 and will dump Renton's secondary effluent in a location admittedly inferior to the site originally recommended and carried through publicly reviewed final EIS procedures.

The situation today, then, is that METRO and possibly other sewer districts are planning to substantially increase the stress on Puget Sound, even though that estuary is already described by NOAA as being in an 11-hour stress condition.

METRO is now discharging about 140 million gallons daily of primary sewage from their four plants in Puget Sound: Alki, West Point, Carkeek, and the Richmond Beach plant.

The other 23 municipalities who use the central basin in Puget Sound as their septic tank, discharge an additional 64 million gallons of primary sewage into the same body of water.

The total discharge from these 24 municipalities will be approximately 500 million gallons daily by the year 2005.

EPA's bulletin, "Washington Environmental Quality Profile, 1978", lists, on page 28, that there are 25,000 surface acres in the central Puget Sound basin as shellfish growing areas. This basin is the body of water between Tacoma on the south, Usless Bay on the north, Bremerton on the west, and Seattle on the east.

This is where the 24 municipalities are now discharging their 204 million gallons daily of primary sewer solids.

Five thousand of these 25,000 surface acres are open to the commercial taking of shellfish. One thousand acres are conditionally approved, and 19,000 are closed to the commercial taking of shellfish.

The Bulletin goes on to say, on page 27:

> Most of the closed growing areas are due to fecal contamination or the great potential for such contamination resulting from nearness to municipal sewage treatment facilities serving populated areas.

A combined effect of METRO's 23 municipalities, nonpoint sources of pollution, industrial wastes and toxic materials, all discharged into Puget Sound, are producing the same conditions that are destroying the Mediterranean Sea.

The Mediterranean Sea is a body of water more than 5,000 times larger than Puget Sound. It is in trouble because of man's abuses. Then why not Puget Sound?

We recognize that secondary treatment of sewage will not remove all of the chemical toxins, particularly those that are in solution or that may go into solution during the treatment process, but it is a major step in the right direction and long overdue.

Pretreatment could take care of industrially discharged chemical toxins or heavy metals in solution or not. If fines are levied which are larger than the cost of pretreatment—usually, they are not. In any event, in the METRO service area, domestic sewage in early 1981 accounted for 95 percent of METRO's total flow.

We know of no practical way of policing each residence and apartment to assure the nonentry of toxic household chemicals or heavy metals into the domestic sewage stream. Rhetoric and brochures will not do the job, but secondary treatment will help a lot.

Our position, then, is simple. If Congress wishes to hold Puget Sound at least to its 11th-hour danger point, stress condition, and, we hope that is your wish, prohibit the discharge of effluent into the waterways of the United States, and by no means provide subsidies for effluent discharges in locations that are admittedly less desirable than the known alternates.

One other national issue that your committee should take the lead in seeing that a solution is found, one that is depressing salt water dependent resources in the coastal areas of America and becoming more prevalent in Puget Sound: That is the scourge, Red Tide. What causes it? What damage does it do? What can be done to control or prevent it? Answers to these questions must be found. The best one to address the problem is the Federal Government.

The Puget Sound is a national treasure, and no one can dispute its economic value to this area. However, if local units of government fail to implement a plan for its protection, and the State of Washington is reluctant to assert its authority, then for the best interests of America and this national treasure, the Federal Government must step in, similar to what they did with the pulping industry in the late 1960's and early 1970's.

You demanded with the cooperation of the State that the pulping industries cease and desist dumping their waste into the public waters, and they did.

We ask most sincerely, with all of their toxic materials, heavy metals and primary domestic sewage effluent being dumped into the public waters, then why shouldn't municipalities be subjected to the same directives?

Thank you for the opportunity to testify.

[An attachment to Mr. Wimmer's statement follows:]

[From the Seattle Journal of Commerce, Sept. 4, 1982]

PUGET SOUND HAS REACHED DANGER POINT, SAYS NOAA

BELLEVUE (UPI)—Puget Sound has reached the danger point.

The Sound, despite the blue beauty of its waters, is suffering from toxic chemical pollution and is in its "11th hour," warns the chief environment officer of the National Oceanic & Atmospheric Administration.

Donald C. Malins told the Bellevue Rotary Club Tuesday that a three-year federal study showed widespread pollution throughout the Sound, including chemicals that had drifted far from their sources.

He said researchers found "inordinately high" levels of lead and hydrocarbons 100 feet deep in waters 1½ miles out of Elliott Bay—far from any source. Some waste from the Duwamish River was tracked around Vashon Island and back again.

Levels of toxic PCBs (polychlorinated biphenyls) are higher in Elliott Bay off Seattle than they are in Commencement Bay off Tacoma, which has been listed as one of the nation's 10 worst toxic waste sites, Malins reported.

Lake Washington ship canal shows high levels of hydrocarbon chemicals, while bottomfish with liver tumors have been caught five miles upstream on the Duwamish.

"There's not much further it can go," the federal official said of Puget Sound. "If it gets much beyond this point, it will be pretty hard to reverse."

The toxic pollution has caused liver tumors, fin erosion and abnormal blood cell counts in fish taken from the Sound, Malins said.

He said government agencies must track down and stop new sources of pollutants and continue monitoring the spread of toxins already in the Sound.

Despite budget cutbacks, the federal agency is continuing with a monitoring program on the water around Everett and Bellingham, he said.

POLLUTION STUDIES OF FISH ARE FLOUNDERING

The presence of diseased bottomfish in the polluted bays of Puget Sound has been public knowledge for two years, but government agencies have been slow to address the problem.

"There has not been the response one might expect to a problem as serious as this," says Donald C. Malins of the National Oceanic and Atmospheric Administration.

Malins heads the NOAA team that last week discovered a surprisingly high number of diseased bottomfish in Port Gardner, off Everett's waterfront. NOAA scientists previously identified high numbers of diseased fish in Elliott Bay, the Duwamish River and the Lake Washington Ship Canal in Seattle, and in Tacoma's Commencement Bay.

NOAA has no authority to regulate pollution. When questioned, officials with agencies that do have regulatory authority either passed the buck to other agencies, pleaded poverty or said they lacked information to deal with the problem.

At the state Department of Ecology, the lead agency in protecting the water quality of Puget Sound, deputy director John Spencer said his agency has done no testing of fish for two years.

"We've had tremendous budget cuts," Spencer explained. "We're at the end of our rope in staff time and lab capability."

The ecology department will meet next week with NOAA, the federal Environmental Protection Agency and public health officials to ascertain what ought to be done about the Everett situation, he said.

While the EPA is spending money studying the pollution problem in Tacoma's Commencement Bay, no consideration is being given to using federal environmetal clean-up funds to attack the problem in Everett, said EPA spokesman Bob Jacobson. That agency has begun a study with Tacoma health department officials to determine health effects of diseased bottomfish consumption, he said, but the study is not finished.

"We're not doing anything," said U.S. Food and Drug Administration spokeswoman Sue Hutchcroft. "We've ascertained that none of it (deceased bottomfish) is being sold commercially."

The poor catch in polluted areas serves as a guarantee that sick fish—which are not readily identifiable without scientific scrutiny—are not entering the commercial food market, Eastwood said. The FDA has no jurisdiction over noncommercial fisheries.

The State Department of Fisheries does not issue warnings about sick fish to sports fishermen, said Mark Pedersen, of the department's groundfisheries division, nor does the agency test for sick fish. But it could close down a fishery if another agency provided the proof that this was necessary according to deputy director Bill Wilkerson.

Snohomish County Health Department chief. Dr. Claris Hyatt, said she issued warnings to people "definitely not to fish at the waterfront. We don't know if there is a health risk. There may be one.

"At this point we don't have a role" in determining if the fish are safe to eat, said Jack Allard, epidemiologist in charge of the State Department of Social and Health Services lab. That's because no human illness has been blamed on the fish, he said.

Senator GORTON. Thank you, Tom.

Dr. Nicola.

STATEMENT OF BUD NICOLA, DIRECTOR, TACOMA-PIERCE COUNTY HEALTH DEPARTMENT

Dr. NICOLA. Mr. Chairman, members of the committee, my name is Bud Nicola. I am a public health physician, director of the Tacoma-Pierce County Health Department.

Chemical pollution in the Puget Sound poses a large question for public health officials. What is the risk to human health? The question was raised in the fall of 1980 in Tacoma when the NOAA study uncovered the liver tumors that you just heard about in bottomfish.

A multiagency task force has been meeting periodically since that time to pool information from a variety of different studies and to give a common direction to research efforts.

In Commencement Bay, it would appear that we are actually very close to defining the specific risk to human health from eating specific species of bottomfish or shellfish caught in a specific location in the Bay.

During the summer and fall of 1981, the Tacoma Health Department ran a fish/crustacean catch consumption study. This study tried to determine the amount of and species of fish consumed, and the demographic characteristics of the Commencement Bay fisherman.

To put it into English, what we did was to send out a survey to six different locations in Commencement Bay to survey fishermen who were there to find out who the fishermen were, get some demographic characteristics about them, and to weigh whatever fish there were.

Our surveyor was a marine biologist and identified the species of fish, so we had the weight and the species of fish.

The next step after we finished the fish survey was to try and identify and measure the edible fish tissue from the same species of fish for organic and metallic pollutants and compare the results of these fish, the fish caught in Commencement Bay, with fish caught in what was supposed to be the pristine environment, the control, Discovery Bay.

The Environmental Protection Agency is in the final review stages of this particular study. This information, when released in the near future, will allow the Health Department to inform the fishing public about the level of health risk from organic compounds and heavy metals and, if risks are high, to take further steps to protect the public.

Human health standards for exposure to toxic metal chemicals are based on animal models or epidemiologic studies of people exposed to the substances concerned.

Human health standards are established for acute toxicity, that is, ingestion of a large amount at once, and for chronic toxicity, adverse health effects, such as cancer from low levels of chemicals over a period of time.

The amount of chemical, such as PCB, found in the fish analyzed in the NOAA studies thus far, has been below the Food and Drug Administration level.

However, the action levels are not established for most of the heavy metals and organic chemicals now being tested for this EPA study.

Interpretation of data where there are no established human health standards is inexact and speculative at the best. Last week, a number of agency officials that testified here today met to review data from various studies; the Centers for Disease Control in Atlanta sent a physician toxicologist, Dr. Renate Kimbrough.

She had several comments, and I will give to you for your consideration a copy of the letter that she sent to the EPA. Dr. Kimbrough had several comments.

The first observation was that the lesions that were found in these fish are not a unique finding in those fish. There are lesions in fish in Chesapeake Bay and the Ohio River valley. One cannot say that the chemicals caused these lesions; in fact, the chemicals may induce a virus to cause this particular kind of tumor.

The second point she made is that we usually tell people not to eat diseased animals. I think that is generally good advice.

Her final point was that fish are generally sensitive to environmental pollutants. When we measured the fish, the levels of pollutants found have not been high: Those fish with high chemical levels may be dying and thus not caught.

We also had a meeting last week of local and State health officials and arrived at recommendations for the public consumption of fish, summarized in a news release of October 21 from Dr. John Beare's office in the State division of health.

The recommendations include Seattle/King County, Snohomish and Pierce County:

First, fishermen whose habit it is to fish along the Seattle/Tacoma waterfront should be aware that chemical wastes have been detected in the Sound.

Second, because of the chemical contamination and the uncertainty about possible health effects, the health services division recommends that individuals not fish or gather shellfish on parts of Elliot, Commencement, and Port Garner Bays adjacent to industrial areas. This recommendation pertains particularly to bottom fish, such as sole and cod, which have the greatest exposure to chemical waste.

Third, should it be necessary to fish in these areas, it would be prudent to eat only the fish muscle, the flesh. Strip away and discard the skin, fat, internal organs, and head. This is recommended because muscle tissue contains the lowest levels of chemical contamination.

Consumption should be limited to an occasional fish. Since the liver contains the highest concentration of chemical contaminants, the liver should not be eaten from any fish caught anywhere in these bays.

Fourth, there is no cause for concern that migratory fish, such as salmon and steelhead, are in any way affected. Further, there is no evidence that levels of synthetic organic chemicals reported to date can cause any acute or chronic health problem.

The above recommendations are cautionary and recognize the limitations of current knowledge on the toxicity of many synthetic organic chemicals.

Senator GORTON. Thank you, Doctor. Mr. Lampe.

STATEMENT OF JOHN B. LAMPE, SUPERINTENDENT, WATER QUALITY, MUNICIPALITY OF METROPOLITAN SEATTLE

Mr. LAMPE. Thank you. My name is John Lampe. I am superintendent of water quality for the municipality of metropolitan Seattle, better known as Metro. I appreciate the opportunity to address the hearing today.

I have submitted written testimony for the record.

Senator GORTON. That will be included in its entirety.

Mr. LAMPE. Given the time frame, I will try to be brief. In fact, I will focus on the questions which the panel raised earlier in the conversation.

I'd like to emphasize three of the points made. First of all, are things getting better or worse? As the agency that is locally chartered to deal not just with water quality research, but to actually take action that can improve water quality, this is obviously a very important question to us. And it is one we believe is important at this point in the whole analysis of synthetic organic chemicals or toxins as they pertain to Puget Sound.

Second, the question of public health. There is sufficient information available now for us to focus on the two questions: Are things getting better or worse; and what are, in fact, the specific public health implications of the information currently at hand. These questions need to be addressed without looking for more chemicals and more problems.

I think we owe it to the citizens of this region to really focus on those two questions and bring some perspective to the issue of what can be done about synthetic organic chemicals.

The third point that was brought out in questioning was whether or not our area is replicated across the country. As I think the testimony would indicate, certainly in terms of the problem, it would appear that our area is replicated across this Nation.

Almost every urban area in which there has been some look for these toxic chemicals, they have been found and have been found in relatively high concentrations, as compared to nonurbanized areas.

What is significant here is that Puget Sound represents a unique opportunity for this Nation, in that we are much further advanced in our ability to understand and deal with the question of toxic chemicals than any other urban area of the country with which I am familiar.

That point has been made by the department of ecology and by EPA, and by NOAA as well.

We do have a unique opportunity here to do something significant in terms of leading this Nation on what can be done. Not just how you find the synthetic organic chemicals, which is a difficult scientific question in and of itself, but what can be done with them.

If I can take your time for just 2 more minutes, I'd like to describe the approach which the METRO Council initiated some 3 years ago. Our approach is somewhat different from that which has been presented by NOAA, which is basically a research organization, or by EPA or by DOE looking at the issue from a regulatory perspective.

We are looking at it from the perspective of an agency with local responsibility to maintain water quality and with the ability to take some actions to implement solutions to the problems.

It was in that light that we undertook a $4 million local investment to simply look at the question of toxins in the aquatic environment. That was a decision made 3 years ago by the METRO Council, and to this day, no other area has made the same kind of commitment of local resources.

Those funds were matched by the Department of Ecology and by EPA, so that we could undertake a comprehensive investigation, not only dealing with the effects of these toxic chemicals in the aquatic environment which NOAA has done so well, but also to look at the key question you asked earlier: Where are these chemicals coming from?

We have looked not only at the marine water environemnt, but at the freshwater environment as well. As you well know, the freshwaters of Lake Washington and Lake Sammamish, our streams, our rivers, our salmon spawning areas, are tremendously important attributes to this area's lifestyle.

So, we are looking at freshwater as well as marine water systems. We have looked in many of the same ways and many of the same places that NOAA has looked for the synthetic organic chemicals.

Our data is somewhat preliminary in terms of sources. We will be coming forward with our findings in approximately 9 months.

Essentially, what we are finding are significant contributions of metals and polynuclear aromatics from surface water runoff coming off the streets. These are things associated with street dust which may come from atmospheric fallout on the streets and from the activities of automobiles and associated land uses.

We find that in the atmosphere there are significant concentrations of metals and the polynuclear materials. And again, these materials ultimately are washed off the land and into the aquatic environment.

We've looked in the sewage systems themselves. In those systems which METRO operates, we've tried to take specific looks at which of these particular chemicals might come from residential, commercial, or from primarily industrial sources into the treatment plants. And we've looked at how the treatment plants are performing in terms of effectively removing or inactivating these materials.

What we have found is that there are some relatively significant levels of metals in residential areas coming from the water supply itself. The significant characteristic we find in industrial sewage which we do not find coming from any other source is that of the solvents. These are particularly expected to be coming from the industrial sector.

Our data, as I suggested, will be available in about 9 months, and our entire approach, from METRO's perspective, is to try and target things which METRO can do in order to prevent synthetic organic materials from coming into the environment.

It was also in that light that not only did we commit to a rigorous scientific approach, but we also looked at what one might call an intuitive approach to the question of toxic materials.

What can be done in a commonsense sort of way to reduce or eliminate the contribution of toxic materials into the aquatic environment without requiring major studies or major justifications in order to support multimillion-dollar expenditures.

So, we looked at the whole question of what could be done to allow the individual in the community to dispose of small quantities of toxic materials.

Nowhere in the country is there a method for the individual to identify and dispose of a small quantity of a banned pesticide.

Quite often, the material ends up in the sewer or is dumped on the land, in the local creek, or in a storm drain.

We've developed programs here that provide citizens within the metropolitan area an opportunity to call one telephone number and find a place where he can take that material at no charge and have it disposed.

We've done many other things of that nature. We've developed a coordinated mechanism that will provide people a telephone number or network to call and get specific answers as to how to deal with various chemicals they may find or come in contact with in the region.

So, there are many things that can be done that simply are very intuitive. They make sense. They don't require any changes of lifestyle. They don't require any major expenditures of resources in order to deal with them.

But on the other hand, there may be many solutions which will be very expensive and which will require very difficult resource allocation decisions to be made.

So, those we are approaching in terms of what METRO can do, what sewage treatment can we provide, what additional collection systems can we provide, what combined sewer overflows can we correct, and so forth.

The impact of these decisions on the environment must be assessed and we must be able to explain them very clearly to the citizens so they can see the exact justification for their involvement.

In conclusion, again, I would like to stress from our perspective that the focus on whether things are getting better or worse is critical for the general citizens' understanding of the issue, and for their continuing interest with the development of solutions. The second question is: What are the public health implications of what we now know? And the third point I'd like to leave you with is that we, in this urban area, have a unique opportunity.

We have more expertise, more data, more demonstrated commitment to this problem than any other area in the country. And if we could find a way to have, not mandates at the Federal level, but rather incentives at the Federal level which recognize this kind of local initiative, it would be to all of our benefits. Thank you.

Senator GORTON. Thank you very much.

STATEMENT OF ALYN C. DUXBURY

Professor DUXBURY. I've been asked to explain why I am here in my particular role today. I've had a long association with several groups that have been seeking an understanding of the Puget Sound environment and the effects of man's uses, since about 1970 or 1971. I was a member of the citizens advisory committee to METRO when METRO started to tackle the problem of the West Point treatment plant and Public Law 92-500.

More recently, I have been a technical adviser to METRO on the toxicant program that you've heard about today. I also work with State agencies as an adviser. I'm working with the department of ecology at the present time on their Puget Sound sensitive area study.

Also, I am advising the Washington State Department of Fisheries on their aquaculture chart series. I'm oftentimes called upon by citizen groups which have problems interpreting what's going on in Puget Sound and evaluating impacts of developments.

I do this under the auspices of the Washington Sea Grant program, which has an advisory service type component. I make myself available whenever possible and practical.

I was asked to come today to listen to what was being presented and try to give some type of wrapup.

I think we can very rapidly enumerate the kind of studies that are going on in Puget Sound from what has been presented today.

There is the present effort to identify what kinds of toxicants we have, and where are they located. We have another effort which is trying to define how these toxicants move through the environment.

We have yet another effort which is seeking to identify the sources of toxicants, and studying programs that might be utilized to eliminate these toxicants at the source.

The fate and effects portions of these studies are typing to establish statistical relationships between toxicant abundance and industrial centers, and further establish the statistical relationships between diseased fish, toxicant types, and their concentration.

Today, we have heard some conflicting testimony about relationship between disease and toxicant levels. This occurs because we are very hard pressed to establish a real, direct cause-and-effect relationship between fish disease and toxicants.

I can give you an example of this: Dr. Malins, of the National Marine Fishery Service, issued NOAA Technical Memorandum OMPA–November 2, 1980, entitled "Chemical Contaminants and Biological Abnormalities in central and southern Puget Sound.

I remember seeing a table in this particular report that listed samples of livers indicating those that were normal and those that were diseased, table 38, page 109. In another place, there was a graph showing the chemical composition of these liver samples. In these 11 samples, it was found that almost as much of the same kind of chemicals were present in both the 6 diseased and 5 nondiseased type livers—figure 78, page 186. Evidence of this type turns out to be inconclusive.

We also have a contradiction that was brought up by John Spencer of DOE when he indicated that the DOE observed frequency of occurrence of diseased fish at Everett, where we have a toxicant problem, was not to be as great as that indicated by Dr. Malins.

Our contradiction may well be the result of a sampling problem. Discrepancies could very easily result from how fish are sampled, or what happens when you sample fish. Sampling difficulties could cause the differences that we see in the high ratios between diseased fish and nondiseased fish in certain locations.

You could also account for the distribution of diseased fish by assuming that the fish diseases aren't related to the toxicants found in the sediments at specific locations. Instead, fish which have toxicants within their bodies and become ill or sick, may prefer to go to a freshwater area for a period of time to seek relief.

This would assure finding a high ratio of diseased fish near the freshwater environment close to the industrial sites rather than the high ratio of disease being due specifically to localized concentrations of toxicant.

Many things might be happening. All the possibilities are still pretty much unanswered. However, I think the important thing is that we should operate under the axiom, "Where there is smoke, there is fire," and not become too preoccupied with the necessity of proof.

We should look at these areas of known toxicants and try to solve the problem that most likely are associated with them. What do we do now with those marine areas that we know are contaminated? There has been talk today about using Superfunds to clean them up.

There has been talk today about the fact that since these toxic contaminated areas are on State land, cleanup requires a partnership between the State and the Federal Government. However, in the State right now the money problems seem to be rather severe and cleanup of the sediments might not be the correct method of solving this particular problem.

Instead, it might be better to simply seal these marine sediments off by placing clean material over the top of them and isolating them from further contact with marine life.

We heard today of the public's concern for waste discharge practices contemplated by METRO. Yet, the fact remains that we have to have discharges into the Puget Sound. We've got to put the role these discharges play as a transporter of toxicants into perspective with other transports of toxicants.

We've got to look at the magnitude of natural transport versus man-controlled transport, and realize we would be remiss if we tried to make very expensive corrections on those anthropogenic sources which might be very small in terms of other sources of toxicants.

When we have discussions like we've had today and there is conflicting information, I cannot help but wonder how the public interprets it. The public, I think, has the problem of being exposed to a one-sided discussion from the popular press, "Don't eat this, don't eat that, fish are diseased." This policy of the press scares the public rather than informing them of the actual situation. They react in response to this fear, and when you try to do anything that's practical in the Puget Sound, they rebel. This prevents securing their cooperation when uses of the Sound are necessary.

I would like to see us undertake an effort—in fact, I would like to see the information from this hearing today disseminated in its entirety so the public will understand that EPA does recognize that Puget Sound is getting better. That everyone does not believe our present problems are as widespread and severe as some indicate, and that present practices are protecting our environment. It should be emphasized that in general, past practices are the ones which are at fault.

In summary, I believe that today's meeting points out that we have to work together on Puget Sound. We have to continue to use Puget Sound and consider it as a regional resource. We have to stop considering Puget Sound as something that can be subdivided on political boundaries with each city doing what it wishes independent of another city.

We have to look at the problems of sewage disposal and disposal of any effluents and solve these as a regional problem.

I don't know how fast we'll be able to accomplish this, but I think we're all headed in the right direction. I was very pleased to be part of this discussion.

Senator GORTON. Thank you very, very much.

Mr. Wimmer, as is always the case when you testify or speak to any of us, you have a very explicit and express set of ideas, and they were very cogent. As I think you know, when we go back into the lame-duck session, in the Senate, and I'm sure in the House as well, we are going to continue the reauthorization process for the Clean Water Act and almost certainly some part of that will go over to the next year.

I would urge you and the organization which you represent to contact us on changes which you think are appropriate or important for that process as promptly as you can.

Mr. **Wimmer**. Thank you, Senator. The only suggestion I might have right now is leave it as is, so things could happen. But I think the big problem is, we are fearful that the administration might do a lot of things to weaken it, and if you do that, there goes Puget Sound, because Puget Sound is not in a healthy condition now.

Senator **Gorton**. As I say, put that in writing. I think it would be helpful to us.

Dr. Nicola, you ended your testimony by quoting from a bulletin which you all came out with as a result of your studies. I may have missed it, but it did not seem to me that the bulletin was necessarily site specific. Are you, and is the task force of which you are a part, going ahead with this project, and are you going to be more specific as to places of particular concern or danger in the foreseeable future?

Dr. **Nicola**. I think each of us in our own specific location, as far as the health officers go, have to look at what evidence they have, and I think we'll find that if there are problems there in specific species of fish, with specific chemicals, then we would be able to say, for example, "This appears to be the place where most of the chemicals are found in fish. Don't fish here for this kind of fish."

The statement that you heard today was a general recommendation for Puget Sound.

Senator **Gorton**. And finally, Mr. Lampe, you did describe the way in which the direction of your research differs from that of EPA and, for that matter, of NOAA. Do you feel that the kind of research which you are doing, that the regulatory agencies are doing, that NOAA and the Fisheries Services are doing, is consistent with one another. That is, while you may not be going for exactly the same things, is what they're doing helpful to you, and is what you're doing helpful to them, and do you communicate well?

Mr. **Lampe**. Unquestionably. But the point I'd like to make is that we've now developed a body of communication that leads us to another decision point. And perhaps now we need to sit down again and take a look at all the research that we are individually proposing to do and reorient and refocus to a more solution-oriented program, more applied at this point.

Senator **Gorton**. OK. Thank you.

Congressman **Lowry**. Mr. Wimmer, in your one paragraph summary, the last sentence says that by no means provide subsidies for effluent discharges that are admittedly less desirable than known alternatives.

That's a hook thrown out there I just can't let go by. What does that mean?

Mr. **Wimmer**. That means the Federal Government is subsidizing METRO to discharge the effluents from the Renton Treatment Plant out into the Three Tree Point area of the King County Park. And they admit, or it's been admitted, that the best location for that outfall is at Alki Point.

Congressman **Lowry**. When you say "admitted" or "those statements" or that was in previous EIS, what do you mean by that?

Mr. **Wimmer**. Well, I think the previous EIS. It's been alluded that the Alki Point was a much more practical outfall than the one they're talking about.

As a matter of fact, a lot of retesting that's been going on is beginning to prove that it's possible, if not a practical idea.

It's going to cost the area a tremendous amount of money.

Congressman LOWRY. But the METRO Council chose the Three Tree Point location anyway?

Mr. WIMMER. Well, that's where METRO wanted it.

Congressman LOWRY. OK. Just one more question. Mr. Lampe, I believe METRO has about five applications in for waivers on the secondary treatment plants. Is that correct?

Mr. LAMPE. That's correct.

Congressman LOWRY. Could you just briefly say why that, especially in contrast to the concerns stated by Mr. Wimmer in this whole subject area?

Mr. LAMPE. Without getting into specifics, because as Tom indicated, he first raised these concerns back in 1977 and they've been a continuous matter for discussion since that time.

The general wisdom of the public health community is that they won't recommend harvesting claims anywhere in the vicinity of a sewage treatment plant. This is not because the treatment plant, when it's performing normally, would in any way pollute the clams, but because you always run the risk of a failure of the treatment plant that could cause contamination.

It was that kind of information that was used by the METRO Council to make its decision to apply for marine secondary waivers. Again, this is based on 10 years' detailed, documented research on the Sound, where the orientation of research was a problem-solving approach.

The council's approach was, let's go to Puget Sound and see what problems secondary treatment would correct. Let us identify problems, and go into secondary treatment if it will help us with them, because with that information, we can go to our ratepayers and we can get them to implement secondary treatment.

In 10 years of the most sophisticated research at that point done by independent organizations, the University of Washington being preeminent among them, we could not develop justifications for going to secondary treatment.

Therefore, METRO could not go to our citizens or our ratepayers and suggest they spend $200 million for something we could not show any benefit in doing.

Congressman LOWRY. Do you think any of the concerns that have been stated today might be starting to justify some of that? I mean, that's a very broad thing, but I don't know that much more about it.

Mr. LAMPE. No, except that again, Tom states the point, I guess more stridently than it is with the METRO Council. The metropolitan council's decision is based upon information to date which, after all is said and done, any decisionmaker has to state. Based upon information available, we can't justify going to secondary treatment.

That is one of the reasons why 3 years ago, they committed $4 million of local ratepayer's money to look at the then-new issue of toxic chemicals, synthetic organic chemicals, to see if at least in that new area, there might be justification for going to secondary treatment.

The final information on that is not in, and as I indicated, in 9 months, we'll have some information.

Senator GORTON. Congressman Pritchard.

Congressman PRITCHARD. Let me ask one question here. You say that the condition in the Sound is getting better. Now, the question that comes about, if you're pouring this in rapidly and you're drinking from the Sound, and there you are, now you slow down and you're hardly pouring it in at all, so it might be that you've improved the rate of what you're doing to the Sound, the deterioration, but in totality, why the whole situation is becoming more fragile and it might be getting worse.

Is there something to that kind of an argument?

Mr. LAMPE. Definitely. This again is why the council put up $4 million of its own money. I think what has been said earlier, and I again do not have the information to be able to assert whether the Sound is getting better or worse. This is a very important question that we ought to start focusing our resources to try and answer. What we can assert is that from all the available information, the rate at which those things are going into the Sound is significantly diminished.

But your point is the critical point. Still, are things getting worse? And that's what we need to take a look at.

Congressman PRITCHARD. At one point, Senator Gorton and I were involved in the METRO battle, and I was on the 50-citizen committee. Why, we do think back and it's been enormously important to our community, what they've done, but we do have to look at the hard facts, at the hard choices.

Mr. LAMPE. One comment, Congressman, is that the key to the whole question is again relating resources and alternatives.

Tom raises a question of citizen concern and it will perhaps arise again at a point of trying to determine when we should spend money to do something that may have an impact on toxic chemicals, and when we should start spending money on shellfish.

Senator GORTON. Thank you. I'd like to thank everyone who has participated in this hearing for your time and preparation. I want to thank all of those who have simply submitted their written testimony as well.

I do have a couple of comments. We've had an opportunity to hear from many of the groups and individuals who are familiar with, and interested in, the problem of toxic chemical pollution in portions of Puget Sound.

I have heard descriptions of these toxics and how they can affect the biological environment, and a description of the ongoing basic research and how to use that basic research.

And finally, we have heard how all of this affects the people who actually live here.

There's obviously no lack of interest or feeling about this problem. Simply the size of the meeting here today demonstrates that. Every one of us is affected by it. Puget Sound is central to our existence in western Washington.

The real question is, where do we go next? I think that many of you probably share with me some sense of frustration that we can't just easily say that these are the steps we need to take, and here are some other steps we don't need to take.

Obviously, we need to learn more over the course of time, but we are doing something about the problems we know.

I am encouraged by Professor Duxbury's reviews of the testimony of many on the panels, which is to the effect that we not only have slowed down the deterioration, but that we have, in many respects, turned the corner and are going in the right direction.

In my judgment, where we go from here is to focus on the problem, and on studying and understanding the precise nature of the problem.

The problem is complicated by the fact that there are so many diverse actors with diverse mandates and interests: State agencies, Federal agencies, local communities, and citizens' groups.

But as each of us proceeds with our study of our part of the problem, what seems to me to be absolutely critical is that the process be coordinated and cooperative to the maximum possible extent. We simply can't afford to have inconsistent approaches and inconsistent solutions that don't work together.

We'll need many ideas, of course, but we also need a great deal of consideration about what each of us needs to do. I'm not sure as a result of this hearing that we need more Federal laws.

I suspect that we do need, and every one of the four Members of Congress who is up here is supportive of this, the kind of Federal assistance which has helped fund the research into the problem and into the solution of the substantive problems.

I do want to thank you for your time and your participation in the hearing of Senate Commerce and Senate Environment Committees and to state once again that if there is anyone in the audience who wished to make a written statement, he or she has 10 days to do so.

Finally, I would like to say that 2 or 3 months from now, copies of this record will be available to interested parties.

I would like to thank my staff. I also would like to thank Senators Packwood and Stafford.

The meeting is adjourned.

[Whereupon, the hearing was adjourned to reconvene at the call of the Chair.]

[Statements submitted for the record follow:]

Testimony of Dr. Howard S. Harris
Manager, MESA Puget Sound Project
Office of Marine Pollution Assessment
National Oceanic and Atmospheric Administration
U. S. Department of Commerce

INTRODUCTION

My name is Howard S. Harris and I am the Manager of the Marine Ecosystems Analysis (MESA) Project for Puget Sound. The MESA Project is administered by the Office of Research and Development within the National Oceanic and Atmospheric Administration (NOAA) of the Department of Commerce. As Project Manager, I am responsible for the planning, coordination, and reporting of a multidisciplinary study of toxic chemicals in Puget Sound.

My testimony this afternoon will discuss the problem of toxic chemical pollution of parts of Puget Sound. I will confine my remarks to a description of the MESA Puget Sound Project and to the Project's findings regarding the presence and distribution of toxic chemicals in the waters and sediments of the Sound.

Puget Sound has long been viewed as a pristine body of water, the home of abundant populations of fish and shellfish, constantly replenished and flushed by clean oceanic waters. But the shores of Puget Sound provide man with a favorable setting for industrial and commercial activities, a setting which has been actively developed over the past four decades. Now, there are questions about the "health" of Puget Sound, especially the health of some of the animals that live in the Sound and which are valued by man.

The MESA Puget Sound Project began a detailed investigation of the presence of toxic chemicals in the Sound and the biological effects of these chemicals in fiscal year 1979. The Project has attempted to characterize conditions throughout the Sound to some degree but has given priority to three industrialized harbors: Commencement Bay near Tacoma, Elliott Bay near Seattle and Sinclair Inlet near Bremerton, Washington.

Our investigators have used a variety of sophisticated physical, chemical, and biological techniques in a coordinated manner that appears unique in marine ecosystem or marine pollution investigations. The Project has used a four-pronged approach to the situation in Puget Sound. An appreciation of these approaches may be useful in following the summary of findings to be presented later.

The first approach was to determine the distributions of toxic chemicals in the sediments and waters of the Sound as well as the presence of toxic chemicals in the tissues of selected animals living in the Sound. Our investigation was not restricted to a pre-defined list of chemicals but attempted the broadest possible characterization using the most modern analytical instruments. A toxic chemical as we use the term means a substance which may cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological or reproductive malfunctions or physical deformities in an animal or its offspring. Examples of classes of chemicals of concern are chlorinated synthetic organic compounds, polyaromatic hydrocarbons and several metals.

The second approach was to identify various biological abnormalities, considering both individual animals collected in the Sound and the communities of marine animals existing at a number of locations covering the range of chemical contamination. Examples of the abnormalities that were found include tumors in the livers of bottom-dwelling fish, missing species of amphipods where they would be expected to occur, reduced ability of young animals to colonize solid surfaces, and reduced numbers and species of animals living in the sediments. The cause of the observed abnormalities is unknown. In some cases the disorders are similar to those observed in laboratory animals (e.g., mice) exposed to toxic chemicals, including those chemicals found in the Sound.

The third approach is an evaluation of the degree to which sediment samples collected in various parts of the Sound can directly induce a biological response under standardized laboratory conditions. To some extent this evaluation parallels the observation of biological abnormalities in the field but additional biological effects are measured and the conditions of exposure are controlled so that any effects that are observed are very likely the result of exposure to chemicals in the sediment samples and not a result of some other factor. The effects being observed include mortality rate, reproductive success, respiration rates and mutagenic effects. The results of these investigations are just now becoming available.

The fourth approach addresses the question of which toxic chemicals of the many occurring in the Sound are, in fact, causing biological problems. Establishing cause-effect relationships under these conditions is an enormously complex task but one that must be addressed if our investigations are to result in feasible remedial or regulatory action.

Our findings to date indicate that parts of Puget Sound have been impacted by man in a serious and detrimental way. The evidence of this impact will be described in a moment. The seriousness of the situation has led agencies to take the following actions:

The U.S. Environmental Protection Agency, in concert with the State of Washington, has designated Commencement Bay near Tacoma for remedial action under the Comprehensive Environmental Response, Compensation and Liability Act. The designated area includes waterways near the port, shallow intermediate areas, and a former dumpsite in deep water near the middle of the bay. The severity of the situation in Commencement Bay is reflected by its inclusion among the top ten priority sites nationally.

The Seattle-King County Health Department and the Tacoma-Pierce County Health Department have issued public advisories cautioning against the consumption of fish and shellfish caught in specified parts of Elliott and Commencement Bays.

TOXIC CHEMICALS IN PUGET SOUND

The MESA Puget Sound Project has planned and financially supported a number of investigations into the presence, geographical distribution, and other characteristics of toxic chemicals in Puget Sound. These investigations began in the summer of 1978 and are now being completed.

Included among our investigators are:

- NOAA's Northwest and Alaska Fisheries Center
- NOAA's Pacific Marine Environmental Laboratory
- Battelle Memorial Institute, Pacific Northwest Laboratories
- University of Washington
- URS Engineers
- E.V.S. Consultants Ltd

The results of our investigations are published and/or incorporated into the Project's data base. The Project makes an effort to disseminate findings to interested agencies, investigators, and other groups upon the completion of each activity. A list of Project publications on toxic chemicals in Puget Sound is attached to this testimony. I can make a limited number of copies available to committee members or staff, if requested.

I have not attempted to summarize this voluminous data base for the purposes of this hearing. Rather, I have attempted to distill the essence of our findings into a number of general statements--statements that convey an overview of the findings.

Definition of Toxic Chemicals

A toxic chemical as the term is used here is a substance which can cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological or reproductive malfunctions, or physical deformities in any organism or its offspring.

At present, we cannot classify a chemical as toxic because of an observed effect in Puget Sound on the animals living there. Various chemicals are termed toxic in the sense that they have the potential for causing toxic effects in the Sound. The suggestion of toxicity rests upon other evidence, e.g., experiments with laboratory animals.

Our ability to detect chemicals is dependent upon the particular instruments and procedures used for analyses. A variety of sophisticated and sensitive procedures have been used. As a result, a large number of potentially toxic chemicals have been identified.

The various chemicals detected in the Sound have been evaluated and categorized considering such factors as toxicity and distribution within the Sound. The chemicals identified as contaminants of concern are:

1. Polychlorinated Dibenzofurans (PCDFs) and their possible precursors, tetra- and pentachlorophenol
2. Chlorinated Butadienes
3. Polyaromatic Hydrocarbons (PAHs) and their Halogenated Derivatives
    a. Naphthalene and Substituted Naphthalene

   b. Benzo(a)anthracene and Dibenzo(a)anthracene
   c. Fluoranthenes
   d. Benzo(a)pyrene
   e. Chlorinated and Bromo-Naphthalenes (PCNs)
   f. Other Halogenated Polyaromatic Hydrocarbons
4. Arsenic
5. Cadmium
6. DDT and its Metabolites
7. Polychlorinated Biphenyls (PCBs)
8. Hexachlorobenzene (HCB) and Other Chlorinated Benzenes
9. Chlorinated Ethylenes
10. Phthalate Acid Esters (PAEs)
11. Copper
12. Lead
13. Mercury
14. Selenium
15. Silver

Geographical Distribution of Toxic Chemicals in Surface Sediments

No parts of the Sound that have been sampled so far are entirely free of toxic chemicals.

Toxic chemical concentrations in sediments generally are high near areas of human industrial activity and low in remote areas. The concentrations are generally highest in industrialized waterways and inner parts of harbors; concentrations are intermediate in less heavily used bays and outer parts of industrialized bays; concentrations are lowest in non-urbanized bays and in the sediments underlying the deep waters of the main basin.

The geographical distribution tends to vary for each chemical. Areas of high concentration or "hotspots" for some do not coincide with the "hot spots" for others.

Near industrialized areas, a large number of chemicals are typically found in sediments. Our investigators have identified those chemicals in highest concentration or a special concern, numbering several hundred chemicals in some sediment samples. With much additional effort, perhaps several thousand chemicals could be identified.

Distribution of Toxic Chemicals in Water

The Project has a relatively small amount of data for water compared to data for sediments.

The water data generally agree with that from the sediments in that the high concentrations of toxics occur in the industrialized waterways of Elliott and Commencement Bays. For example, water data from Elliott Bay show a distinct gradient of high metals level at the mouth of the Duwamish diminishing out into the Bay. Chlorinated hydrocarbons measured in various surveys of the Tacoma waterways also indicated gradients.

The measured concentrations of the chemicals are low in water compared with the sediment. This observation is consistent with the known tendency of these chemicals to associate with particulate matter.

Example Distribution of Toxic Chemicals in Sediment

The average concentration of eight chemicals or classes of chemicals from eight geographical areas in the Sound are presented in Figure 1.

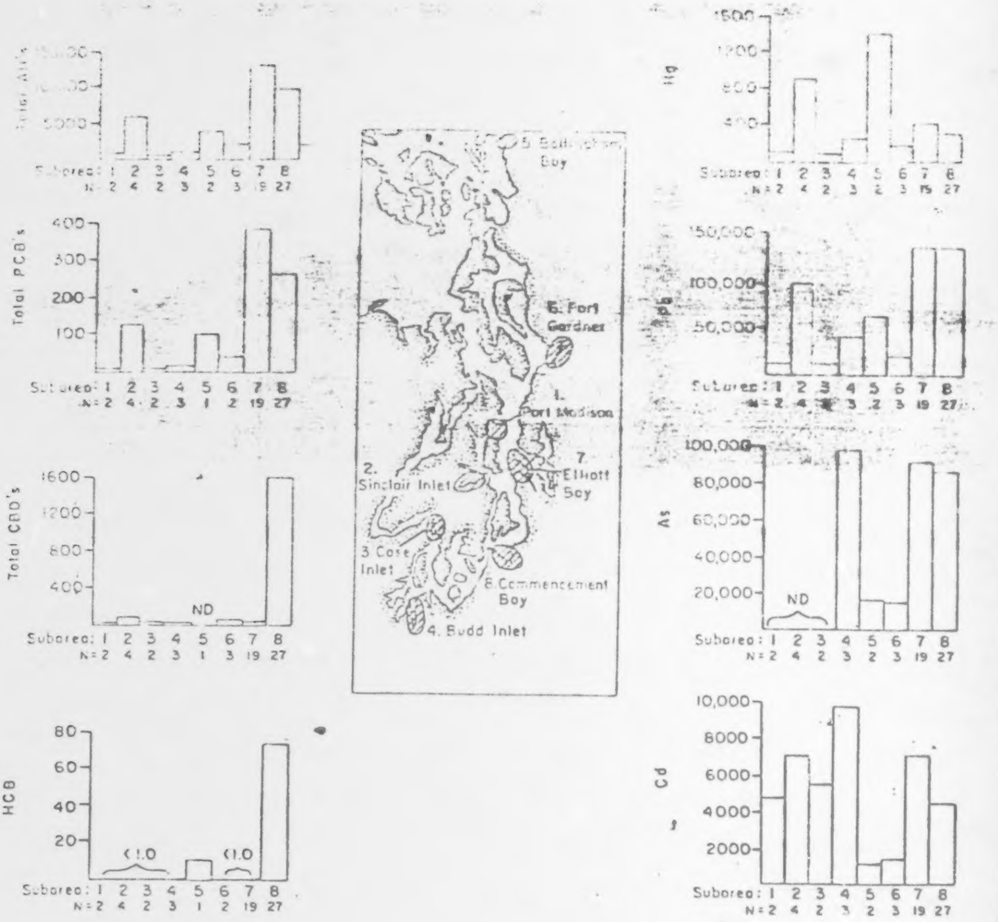

Figure 1. Mean concentrations (ppb, dry weight) per subarea of total aromatic hydrocarbons (AHs), polychlorinated biphenyls (PCBs), chlorinated butadienes (CBDs), hexachlorobenzene (HCB), mercury (Hg), lead (Pb), arsenic (As), and cadmium (Cd) in sediment (from Malins et al., 1982). ND = none detected.

Slide 1: Mean Concentrations of Selected Toxic Chemicals

The eight geographical areas and its subarea number are:

1. Port Madison
2. Sinclair Inlet (near Bremerton)
3. Case Inlet
4. Budd Inlet (near Olympia)
5. Bellingham Bay
6. Port Gardner (near Everett)
7. Elliott Bay (near Seattle)
8. Commencement Bay (near Tacoma)

There are eight chemicals or classes of chemicals considered:

1. Total aromatic hydrocarbons (AHs)
2. Total polychlorinated biphenyls (PCBs)
3. Total chlorinated butadienes (CBDs)
4. Hexachlorobenzene (HBD)
5. Mercury (Hg)
6. Lead (Pb)
7. Arsenic (As)
8. Cadmium (Cd)

The values presented on the several graphs are the average concentration of each chemical expressed as parts per billion (ppb) dry sediment weight. The number of individual samples represented by each average value is indicated as "N" values.

A number of trends are apparent.

- Aromatic hydrocarbons, PCB's, and lead (Pb) are highest in Elliott and Commencement Bays.
- Chlorinated butadienes and hexachlorobenzene are uniquely high in Commencement Bay.
- Mercury (Hg) is high in Bellingham Bay.
- Arsenic (As) is high in Budd Inlet (Olympia) as well as Elliott and Commencement Bay.
- Cadmium (Cd) is highest in Budd Inlet.
- Sinclair Inlet contains moderate concentrations of several of these chemicals.

The biological significance of the presence of toxic chemicals in various subareas of the Sound will be discussed in testimony to be presented by others.

Mr. Chairman, I appreciate greatly the opportunity to present this testimony on the MESA Puget Sound Project and the presence of toxic chemicals in Puget Sound.

Attachment

Selected Bibliography on Toxic Chemicals in Puget Sound

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Testimony of Dr. Eddie N. Bernard

Acting Director, Pacific Marine Environmental Laboratory

Environmental Research Laboratories

National Oceanic and Atmospheric Administration

My name is Eddie N. Bernard. I am the Acting Director of the Pacific Marine Environmental Laboratory of the Environmental Research Laboratories, a component of the National Oceanic and Atmospheric Administration. As Acting Director, I supervise research programs in three general areas of interest to NOAA--ocean climate dynamics, marine observations and predictions, and marine environmental assessment. A staff of approximately 100 persons, including physical oceanographers, chemical oceanographers, geochemists, mathematicians, and other technical specialists, execute these programs.

The Pacific Marine Environmental Laboratory was formed in 1972 although the laboratory has existed under other names since 1962. Over the past 9 years, approximately thirty percent of the laboratory's effort has been directed toward understanding the transport of water and sediment in Puget Sound. Numerous field investigations have been conducted in Puget Sound by this laboratory with sponsorship from the Environmental Research Laboratories, and other NOAA programs of the Office of Marine Pollution Assessment including Marine Ecosystems Analysis Program and the Long Term Effects Program. The information from this research is the basis of my testimony today.

In Puget Sound there are two distinct classes of pollution problems: acute problems associated with localized, perhaps short-term, industrial activity and long-term growth-related problems. The short term events have created the most concern: the industrial refuse in the Hylebos Waterway in Tacoma, and around Harbor Island in the mouth of the Duwamish River, and the PCB spill in the Duwamish River, for example. The long term, growth-related problems are largely those of the disposal of municipal wastes including both the level of treatment and location of disposal sites. The short-term and long-term classes of pollution problems tend to be confused, but they have different origins and different control or remedial strategies. In understanding the transport of particulate-bound pollutants, both classes of problems must be considered.

Ultimately, most pollutants, if not in particulate form, become bound to particles. Two aspects of the behavior of suspended particulate matter in coastal and estuarine waters are of special concern to individuals and agencies concerned with establishing guidelines for the proper use of these waters: 1) particles are major transport agents for a variety of natural and anthropogenic substances; and 2) particles act as sites for various chemical/physical/biological reactions in the water column. Thus my testimony will emphasize the transport of pollutant compounds and elements as particles.

The general approach of the PMEL transport studies is based on the general concept of sources, residences, and sinks. The source areas are the principal rivers and embayments, particularly those with industrial or urban influences, and the sediments of the basin. In Puget Sound the source areas with industrial and urban pollutant inputs are Port Gardner (Everett), the Duwamish River/ Elliott Bay, the Puyallup River/Commencement Bay, and Sinclair Inlet. Toxic metals combine with dissolved organic compounds, especially those from sewage treatment plants, and the combined forms precipitate on entering salt water. Most toxic organic compounds are insoluble in water and either precipitate in salt water or bind to sediment particles. Dissolved metals and organics are assimilated by plankton and converted to solid wastes or dead cells which fall out of the water column. Thus, most toxic compounds entering Puget Sound are associated with organic solids or inorganic sediments.

Once in the Main Basin, suspended particulates are transported vertically by settling and resuspension. Regional redistribution is brought about by horizontal water motion and possible weak density (mud) flows along the slopes of the basin or down the axis of troughs.

Contaminants are lost from the Sound to the atmosphere (also a source), by burial in bottom sediments (also a source), by removal in harvested organisms, and flowing northward over Admiralty Inlet.

Transport of suspended particulate matter may differ somewhat from the transport of water because particles are individually influenced by gravity. Also, particles may be consumed or excreted by animals that can move about in the water. For these two reasons, the resulting transport of particles may be different than the transport of water. Both sediment transport processes and water transport must be understood to ascertain the movement of sediments.

The Puget Sound main basin is a tidally-dominated estuary approximately 115 km long and 6 km wide. It is separated from the Strait of Juan de Fuca by Admiralty Inlet with a sill depth of 64 m and from southern Puget Sound by the Narrows (Tacoma) with a sill depth of 50 m.

The surface layer north of Seattle flows to the north in response to added fresh water. South of Seattle, surface water flows south at all depths on the east side of Vashon Island and north on the west side, setting up a clockwise gyre around the island. This pattern tends to retain pollutants in the southern main basin because we believe that 25% of the water flowing around the island is recycled and particles tend to sediment out in the relatively calm waters of East Passage.

Significant deep water replacement from outside the main basin usually occurs during flood tides exceeding 3.5 m (range) at Seattle although small amounts may be introduced on each tidal cycle. Major replacement may occur seasonally as well. Water near the bottom flows toward the south and is slowly mixed into the surface flow. Any deep water not mixed up with the surface must exit at the southern end of the main basin through the Narrows or north through Colvos Passage. Vertical transport at the southern end of the basin is believed to be accelerated by tidal pumping through the Narrows.

Tidal mixing over both sill entrances to the main basin is intense. This results in a partial recycling of "old" water within the main basin proper. The recycling of water and dissolved constituents is characteristic of estuaries and usually results in an accumulation of nutrients and particulate matter at the river end of the estuary. Because of these flushing characteristics, some fraction (perhaps as high as 95%) of dissolved materials originating in the Sound never leave. Accumulation of these recycled particles occurs over long time frames in preferred areas. The exact size and location of the accumulation areas are not well known.

The distribution of fine particles to which toxic pollutants adhere is closely tied to these circulation processes in the main basin as outlined above. Particle concentrations are generally high in the seaward-flowing surface layer due to input from river runoff and phytoplankton production. Lowest particle concentrations are found near the depth of no-net-motion (~50 m). Below ~100 m, fine particle concentrations increase towards the basin floor. Because of strong tidal currents, there is a southward transport of bottom sediments along the main basin. This is important because it indicates likely areas of sediment accumulation in the southern part of the basin.

Approximately two and one-half million metric tons of sediment (suspended and bed load; mostly suspended) are discharged into the main basin annually. It is worth noting that the two most contaminated rivers contribute only a total of 9% of the total sediment discharge to the main basin. Thus, once the contaminated sediments are carried into the main basin, they are probably diluted tenfold by clean sediments unless, of course, the contaminated sediments have unique properties that facilitate winnowing and concentration.

Elliott Bay Studies: Elliott Bay is the port of Seattle. In that bay there are significant levels of both toxic trace metals and organics in suspended particulate matter and sediments. At present, the distribution of these pollutants seaward of the Duwamish River is unknown. Currents in Elliott Bay are dominated by semi-diurnal tides and are weak year around and are not high enough to resuspend sediments.

Suspended sediment loadings in the bay are principally in two reservoirs - the Duwamish River effluent plume and the bottom resuspended layer. Summer and winter studies suggest that the surface plume is constrained to the north and east portions of Elliott Bay and leaves the bay very rapidly without depositing much material. The surface plume of the inner bay represented about 12 days of Duwamish River input during the August measurements but only about 0.3 days during February. The bottom resuspended layer thus does not originate in the bay itself, tidal currents being so low. Other evidence suggests that this material originates in the deep water of the main basin and is upwelled into the bay.

As discussed in the preceding sections, we have a conceptual understanding of Puget Sound transport of water and sediments. Studies to date have indicated which processes are important, but we have scattered information on the quantitative aspects of these activities. We know that areas of sediment accumulation must occur in the main basin, but we do not know their exact location, size, and rates of accumulation. We do understand the processes well enough to design experiments which will quantify rates of burial, decomposition, re-release, etc., so that predictive models may be usefully employed in resource management. This research addresses the problems of at what rates, in what locations and in what form can municipal wastes be discharged into marine estuaries without unacceptable damage to resources.

The problem of the ultimate residence of contaminated particles must be viewed from two source mechanisms. The high concentration, high toxicity, injections of contaminants into an embayment must be handled on an individual basis to balance the impact to the immediate area and the whole sound. The long term, slow trickle of contaminants into the Sound must be examined through predictive modeling once rates of dispersal, dilution, and burial are quantified. Once predictive models are reliable, rational decisions can be made that balance all uses of the Sound.

Testimony of DR. DONALD C. MALINS
Director, Environmental Conservation Division
Northwest and Alaska Fisheries Center
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
U.S. Department of Commerce

INTRODUCTION

My name is Donald C. Malins. I am the Director of the Environmental Conservation Division at the Northwest and Alaska Fisheries Center (NWAFC) of the National Marine Fisheries Service, a component of the National Oceanic and Atmospheric Administration (NOAA). As Division Director, I supervise research projects of a scientific group of about 60 which includes chemists, pathologists, biologists, physiologists, oceanographers, and other specialists who study the effects of chemicals on marine organisms.

The Division was established at the NWAFC in 1972. It has the mission of identifying the nature and extent of chemical pollution in North Pacific marine environments and of determining the effects of pollution on recreationally and commercially important marine species and their habitats. A large number of field and laboratory investigations have been conducted by this Division in the last 10 years utilizing fish and invertebrates native to Puget Sound. Funding for these studies originated from the National Marine Fisheries Service, from other NOAA programs including the Marine Ecosystems Analysis Program (MESA), from the Bureau of Land Management of the Department of the Interior, and from the Environmental Protection Agency. The information from this research is the basis of my testimony today.

We have studied relations between pollution and diseases of marine life in urban and nonurban areas of Puget Sound (Malins et al. 1982, McCain et al. 1982). The industrialized and highly populated urban areas include Seattle's Elliott Bay, Tacoma's Commencement Bay, Olympia's Budd Inlet, Bremerton's Sinclair Inlet and Everett's Port Gardner. Nonurban areas studied were Case Inlet in south Puget Sound, Port Madison and

Port Susan in central Puget Sound, and Discovery Bay which opens on the Strait of Juan de Fuca.

Slide 1: Map of study areas

We found that bottom-dwelling fish and shellfish take up complex mixtures of potentially toxic chemicals from their environment and store them in tissues and organs, including edible muscle. Generally, the amount accumulated is directly related to the extent of the pollution; that is, fish and shellfish from relatively clean areas, such as Port Madison or Case Inlet, build up very low levels of chemicals; and those living near urban areas, such as the Duwamish River, along Seattle's waterfront, or in the Commencement Bay waterways, accumulate substantially higher levels. We have also observed that fish and shellfish from clean areas contain relatively small numbers of these chemicals. This is in sharp contrast to fish and shellfish from polluted areas which contain large numbers of them.

I should point out that even our most advanced techniques for chemical analyses allow us to detect only a fraction of the chemicals likely to be present in fish from polluted environments. Despite these inherent limitations, we have identified hundreds of chemicals in the tissues of fish and shellfish obtained from highly polluted areas of Puget Sound.

Many of the chemicals, some of which are carcinogenic, found in marine organisms from polluted areas, are converted to a number of other potentially toxic substances by the organisms. For example, hydrocarbons from combustion processes and from petroleum are transformed in the bodies of marine fish into a variety of other toxic compounds.

We have evidence that some react with genetic material (DNA) of fish liver cells, a process that is believed to be a key step in fish liver tumor formation (Varanasi et al. 1981).

A matter of obvious concern is whether the chemicals are transported through the food chain. Little information is available, but many of the chemicals--such as metals and chlorinated compounds in particular--are passed on from fish to higher animals through the diet and thus create potential problems for birds, marine mammals and the human consumer.

Overall, fish and shellfish tend to reflect in their bodies the types and levels of pollutants in their habitats. The accumulated chemicals are stored in tissues for various periods and, as I indicated, many are transformed into various other chemicals. The end result is that various amounts of myriad potentially toxic chemicals--some of which can be identified and some of which cannot (Malins et al. 1980, 1982)--are present in fish and shellfish from urban areas of Puget Sound. The great complexity of these chemical mixtures and the general lack of information on their effects make it virtually impossible to presently define their impact on marine life or the human consumer.

One of our major objectives was to find if there are links between toxic chemicals and diseases in fish and shellfish. We found areas with highly contaminanted sediments tended to have bottom fish with a variety of serious abnormalities, particularly of the liver, but also of the kidney, gills and other organs and tissues. The fish examined most intensively included English sole, rock sole, starry flounder and staghorn sculpin. I will briefly describe only some of the liver conditions.

Three major types of liver abnormalities observed were degenerative lesions, benign and malignant tumors, and lesions considered to be precancerous. It is important to recognize that liver tumors were found only in fish from the urban areas. English sole from the Duwamish Waterway and Everett Harbor had the highest frequencies of this serious, essentially nonreversible condition. In the Duwamish Waterway, 16% of the English sole examined had liver tumors, whereas 12% of the total examined so far from Everett Harbor, that is near pier 1, were similarly affected. Our combined samplings of the Everett Harbor revealed the highest incidence (70%) found in Puget Sound of serious liver diseases in English sole.

Slides 2, 3 and 4: Examples of diseases in fish from urban areas

Slides 5 and 6: Diagrams of prevalences and geographic distribution of diseases

English sole with precancerous lesions and all four species of fish with degenerative lesions were most prevalent in the most chemically contaminated areas of Commencement Bay and Elliott Bay, and the Everett Harbor.

Some of these liver lesions, which we believe are caused by chemical pollutants, are easily visible to the naked eye. They sometimes appear as discolored nodules, and livers with degenerative lesions often have a mottled appearance. Most of the information we acquire on diseases, including the definitive diagnosis, however, is obtained by microscopic examination of tissues.

The fact that the severe forms of liver disease were found primarily in fish from areas near industrial and/or highly populated areas clearly implicates pollution in their cause. Additional evidence implicating pollution is the finding that the lesions are similar to those reported in other animals, including mammals, exposed to toxic chemicals under laboratory conditions.

The impact of the liver diseases on the bottom fish is unknown; however, analyses we conducted revealed that liver function is impaired in the diseased English sole. How these diseases affect survival, reproductive capability, and other vital functions can only be determined through further study.

As a first step in defining cause-and-effect relationships between chemicals and lesions in the bottom-dwelling fish we statistically compared the prevalence of fish with diseases with the chemical compositions of sediments. We considered four main classes of chemicals in sediments from Puget Sound. They were aromatic hydrocarbons, metals, polychlorinated biphenyls (PCBs), and other chlorinated organic compounds, including pesticides. We found a very high correlation between levels of aromatic hydrocarbons and metals and prevalences of English sole and rock sole with liver diseases. Thus, we have been able to focus on certain types of chemicals that appear to play an important role in tumor formation and other serious diseases in Puget Sound fish. By identifying chemicals that are linked to diseases in this way, we are addressing the important question: "Of the large numbers of chemicals in urban marine environments, which ones should receive priority attention in regulating inputs or in cleanup operations?"

We also examined Dungeness crabs for diseases. We found that crabs from urban areas have serious abnormalities of a number of organs (e.g., gill and hepatopancreas); however, we cannot determine at present whether these diseases are pollution-related because an insufficient number of samples has been examined. In our current studies of the Everett area, we are making a special effort to examine a larger number of crabs so that we can identify possible relations between pollution and disease.

It should be noted that no lesions that could be attributed to pollution have thus far been found in clams or marine worms from any area we have studied in Puget Sound.

The highest numbers of invertebrate species were found in the outer portions of the urban marine areas and in nonurban areas, whereas the lowest numbers were found in the urban waterways and the inner portions of urban estuaries. An important finding was that the number of species of clams and worms was substantially lower in sediments having the highest concentrations of metals and aromatic hydrocarbons. Thus, the more severely polluted environments in Puget Sound may not be viable habitats for some invertebrates.

Our data also show that the numbers of fish caught were lower in the more contaminated areas of the urban bays than in the nonurban bays. We are not sure if this is because the fish avoid these environments or because their survival rate is lower in these areas.

Laboratory studies by us and others indicate that many of the chemicals associated with human activities can produce a variety of deleterious effects in marine life, especially in eggs and larvae (Malins 1980, Malins and Hodgins 1981). The extent to which these effects may be a problem for organisms in their natural environments, however, has not yet been determined.

In summary, our field studies in Puget Sound have revealed serious diseases and toxic chemicals in fish and shellfish from highly urbanized and industrialized bays. In addition, communities of bottom-dwelling fish and invertebrates appear to be altered in those portions of the urban bays which have the highest levels of chemical contaminants.

However, there is at present no evidence that commercially marketed fish and shellfish are afflicted with these diseases or that they contain high levels of foreign chemicals in their edible tissues. It should be emphasized that the commerical fishing areas of Puget Sound are not in the highly polluted industrialized areas. However, even though it appears that commercially marketed fish and shellfish from Puget Sound are still wholesome for the consumer, the same situation may well not be true for recreationally caught bottom-fish from the urban bays.

Mr. Chairman, I appreciate having the opportunity to present this testimony on what is obviously an important problem.

APPENDIX

In addition to being Director of the Environmental Conservation Division, Dr. Malins is Affiliate Professor, College of Ocean and Fishery Sciences at the University of Washington and Research Professor of Chemistry at Seattle University. He obtained his PhD in biochemistry from the University of Aberdeen (Scotland), and was later awarded the Doctor of Science from the University for outstanding contributions to marine science. He has published over 100 scientific papers, has lectured widely on the effects of marine pollution and other topics, and is editor of a number of books, including two volumes titled "Effects of Petroleum on Arctic and Subarctic Marine Environments and Organisms". He is Editor-in-Chief of the international journal, AQUATIC TOXICOLOGY and is a consultant to the United Nations Environment Program (UNEP).

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TESTIMONY
BY
JOHN F. SPENCER
DEPUTY DIRECTOR
WASHINGTON STATE DEPARTMENT OF ECOLOGY

I. INTRODUCTION

I am John F. Spencer, Deputy Director of the Washington State Department of Ecology (DOE).

On behalf of Governor John Spellman and Ecology Director Donald W. Moos, I express their appreciation for this hearing and the opportunity to discuss the water quality of Puget Sound.

John R. Spencer has presented a very comprehensive report about the Environmental Protection Agency's (EPA) role in controlling toxic chemical pollution. We are pleased with the actions taken by EPA and the joint efforts we have been able to initiate in dealing with chemical contamination in the Sound.

I will present some background on our pollution control efforts in Everett Harbor and Puget Sound before discussing the actions we have taken most recently and our plans for the future.

II. BACKGROUND

By way of background, I think it is important to note that the citizens of Washington State have consistently supported environmental programs. We were the first state in the nation to create by legislative action a consolidated agency dealing with water quality, air quality, solid waste, and water resources management. This came about in 1970, predating Federal efforts.

The voters have consistently supported statewide bond issues for constructing municipal wastewater treatment facilities to protect our water quality.

A. Puget Sound Conference - 1962 (Attachment #1)

Almost 20 years ago, the first major effort to clean our Puget Sound waters was initiated. The federal Water Pollution Control Administration (now EPA), the state Water Pollution Control Commission (now DOE), the State Department of Health, and local health agencies joined hands in this effort.

This joint effort entitled "Puget Sound Conference" started January 16, 1962. The "Purpose" statement of the Conference was: "To review the existing Puget Sound situation, the progress which has been made to date, lay a basis for future actions by all parties concerned, and to give the state, localities and industries, an opportunity to take any indicated remedial action under state and local law."

The Conference developed a "Washington State Enforcement Project." The objective was to evaluate the impact on the fisheries resources from the pulp and paper mill wastes discharged into Puget Sound.

The similarity today continues as the 1962 project studied four marine water areas: Bellingham Bay, Everett Harbor, Anacortes, and Port Angeles.

The study specifically investigated water quality. One of the principal findings (which reflect today's Puget Sound concerns) included:

> "Bottom sludge from solids in the effluent contained toxic components harmful to fisheries resources."

That single statement brings us to where we are today.

III. ACHIEVEMENTS

The joint "conference" concluded in 1967. Work began immediately at all government levels to address the problems.

A. Compliance Programs

Based on the Conference findings, the state reviewed existing discharge permits - both state and Federal - to determine if compliance schedules were realistic. In many cases, new schedules were drawn up for the major industries discharging into Puget Sound.

The response by industry was varied, but generally the new compliance schedules and requirements were the objects of lengthy litigation.

B. Industrial Tax Credits

As early as 1967, the state Legislature passed the Industrial Pollution Control Tax Credit law. The purpose was to provide an incentive to industries to install pollution control devices and systems. The two year tax credit program continued until its repeal in 1982. The tax credits so far total $500 million.

C. State Bond Issues

The citizens of Washington State went to the polls three times to pass statewide bond issues for municipal wastewater control projects. These were Referendum 17 in 1968 - $25 million; Referendum 26 in 1972 - $225 million; and Referendum 39 in 1980 - $450 million.

Ironically, the latest--Referendum 39--passed because of diminishing Federal funds. Referendum 39 is an absolute 50 percent sharing of costs between the state and the local government entity. This program does not provide matching for any Federal fund assistance.

D. But, The Question Is: "Did All this Clean the Water?"

Yes:

1. The major industrial dischargers into Puget Sound are under permits and in compliance with state and Federal water quality standards:
2. The oyster industry in Oakland Bay near Shelton is back to commercial levels where once Olympia Oysters nearly disappeared;
3. Crab and shrimp are once again caught in the Port Angeles Harbor;
4. Bellingham Bay is cleaner and herring runs are heavy;
5. Everett Harbor live box tests have gone from 100 percent to zero mortality for juvenile salmon;
6. New secondary treatment plants now out number the primary facilities in our state. (Except for those facilities awaiting marine water discharge waivers, the change over to secondary treatment is under construction or virtually completed.)

IV. LOCALIZED PROBLEM AREAS AND CUMULATIVE IMPACTS

Today, we are addressing another aspect of water quality-- cumulative effects from toxic chemical pollution in Puget Sound. We are going beyond the water column and into the sediments which cover our marine areas.

A. Everett Harbor

National Oceanic and Atmospheric Administration (NOAA) findings in Everett Harbor are disturbing for both public health and environmental quality.

Upon receipt of the information from NOAA, we joined with EPA to collect more samples in a broader area of the Harbor. These samples were analyzed at the EPA lab and the results provided to local health authorities.

We are continuing efforts jointly with EPA to determine the source of chemical contamination in Everett Harbor and other areas of Puget Sound. Mr. Spencer of EPA has described our combined efforts to find solutions. As an example, when the NOAA report on chemical contaminants and abnormalities in fish in Puget Sound was published, we noted that the aromatic hydrocarbon Retene had been detected in sediments collected near Bellingham, Everett, Shelton, and Port Angeles.

In order to determine if Retene or related chemicals are present in the current discharges, we sampled one mill's influent and effluent for analysis at the EPA lab.

That analysis identified Retene in one of three samples of effluent taken and the quantity was .5 parts per billion. This is in sharp contrast to what NOAA's analysis found in the sediments of Everett Harbor -- 2900 ppb at Station 1 and 250 ppb at Station 2.

The Everett Harbor possible sources of contamination are current point sources, past discharge and dumping practices and non-point source runoff.

At present, the principal discharge into Everett Harbor is that of the Scott Paper Company's sulfite pulp mill. (See Attachment #2.)

The Weyerhaeuser Company no longer discharges directly into Everett Harbor. (See Attachment #3.)

Weyerhaeuser switched from sulfite pulping to thermomechanical (TM) in 1975. The mill was closed in 1980 primarily because of market conditions. The company's kraft mill in the area discharges into the Snohomish River.

Other current discharges include noncontact cooling water from Western Gear and storm drains. One storm drain has been identified in the past as a source of hydrogen sulfide possibly because it drains an area of dredged material that was disposed of behind dikes in the Harbor. This dredged material was determined to be unsuitable for open water disposal and has been "capped" by dredged material from the Everett Yacht Basin. The fill, however, is unpaved and surface waters permeate through it.

Other storm drains entering Everett Harbor may occasionally discharge overflows from Everett's combined sewers which serve the Paine Field area.

Leachate from the now-closed Tulalip landfill reaches Steamboat Slough, a part of the Snohomish estuary.

Scott Paper achieved compliance with its National Pollutant Discharge Elimination System (NPDES) permit in December 1979.

This reduced the biological oxygen demand (BOD) discharges from 350,000 to 10,000 pounds per day. Scott reduced its pulp production from 750 to 500 tons per day. They cut in half the discharge flow rate from 50 million to 25 million gallons per day.

A $25 million recovery system now recovers about 50 percent of the spent pulping liquor that was being discharged into Port Gardner Bay.

From 1966 through 1971, the total solids (See Attachment #4) discharged into Everett Harbor routinely exceeded 2.5 million pounds per day. By the fourth quarter of 1975, total solids were reduced to less than 500,000 pounds. By December 1979, this was further reduced to 10,000 pounds per day. This was achieved by a combination of pollution control installations and reduced production.

In 1972, DOE, along with EPA, the University of Washington, Washington Department of Fisheries, Scott Paper Company, and the Weyerhaeuser Company, embarked on an Ecological Baseline and Monitoring Study known as ECOBAM in the Everet Harbor. (Attachment #5). Its purpose was to examine the relationships between reductions in pulp mill waste discharges and biological changes in Port Gardner.

This study continued for nine years; a summary report for the years 1972 through 1975 was published in 1976. A final report is in preparation now. The 1976 report shows a tremendous improvement in water quality in Everett Harbor, as measured by oyster larvae bioassay (Figures 10-13, Attachment #5).

Substantial reduction of biochemical oxygen demand (BOD) and total solids brought about improvement in dissolved oxygen levels. This created a level of water quality that could sustain a biological population which prior to 1975 was not possible in the deeper water column throughout Everett Harbor, Port Gardner and parts of Port Susan.

As we have moved from correction of conventional pollutant sources into the more difficult areas of toxics, we have redesigned our surveillance and investigation, analysis, and reporting procedures. We are looking at the toxics problem statewide and will soon publish a Toxics Inventory. This inventory includes the rivers feeding Puget Sound, but does not include marine waters.

Our compliance inspections and intensive surveys are now routinely directed at priority pollutants.

In addition, we are part of EPA's Basic Water Monitoring Network and regularly collect fish and shellfish tissues at four marine stations and analyze for toxics.

B. Mid-Puget Sound

DOE has maintained a marine water quality survey program since 1967. Samples are taken monthly except in winter and analyzed for their chemical and physical properties.

In general, this sampling program has shown waters of the Sound to be of very high quality. However, problem areas do exist. Moreover, it is only in recent years that anyone has been able to analyze for trace organic chemicals which were found in the NOAA research.

In addition to our water quality surveillance, we perform detailed compliance inspections on each pulp mill at least once each year and monthly self-monitoring reports are reviewed by the department regularly for compliance with state requirements.

We will, undoubtedly, continue to find problems similar to Commencement Bay and Everett Harbor in other industrialized bays of Puget Sound. Too many wastes from past practices have been disposed in those areas not to find problems similar to those described by NOAA.

Much less apparent--but no less significant, however--is the decline in Puget Sound of commercial shell fish operations. (Attachment #6.)

Shell fish are a valuable indicator organism for water quality conditions. Hence, Decertification of commercial shell fish grounds is an ominous warning of the effects of urbanization and population growth around Puget Sound.

We currently have 58 areas which have been certified and 12 decertified. Another ten areas are considered "uncertifiable" for commercial harvesting because of water quality conditions. Another category is "threatened" areas in our state.

In addition to the commercial harvesting, Puget Sound is famous for its recreational clam digging activities. Approximately 1.4 million pounds of clams are dug annually in the Puget Sound area. When a commercial decertification occurs, this means that the recreational--family type--activity is also threatened.

Burley Lagoon, in Pierce and Kitsap counties, is a good example of the type of problem resulting from urban and suburban growth. Wastes from septic tanks, urban runoff, animal waste, and poor drainage contribute to the degradation of the shell fish population.

All of Burley Lagoon is presently decertified because the water and the shellfish tissue exceed the standard for fecal coliform (an indicator bacteria).

C. Commencement Bay

Progress has been made in investigating the problems of Commencement Bay. Since the NOAA report, we located all of the discharges (point and nonpoint source) and conducted a water quality survey for each site. The discharges include those permitted, continuous, seasonal, and overland sources. These were sampled and analyzed for chemical constituents by ourselves and EPA.

Our findings to date tell us that chemical concentrations don't exist in current discharges or exist in such small amounts that additional waste treatment is not the answer. Historic problems and past practices have to be dealt with.

If you look at the water column, our clean up efforts have been a success; if you look at the sediments, we see the effect of past practices, some of them not too distant.

V. CURRENT STATUS

There are many efforts now underway to deal with toxic pollution in Puget Sound. Our principle concern is that the efforts are not fragmented among the various public agencies involved.

We have taken the proper and orderly initial steps to study and resolve the problems. It has been a cooperative effort and each agency is presently making important contributions of knowledge and techniques toward the common goal.

A. Puget Sound Sensitive Area Study

In FY 1982, DOE, with EPA funding support, initiated the Puget Sound Sensitive Area Study. This effort is designed to provide a short-term (interim) water quality management strategy for Puget Sound. This will include the identification of areas of Puget Sound which, due to their hydrographic characteristics and beneficial uses, are sensitive to pollutant loading. It also will provide input to the decision process for waivers of secondary treatment requirements for municipal dischargers, Section 301(h) of the Clean Water Act.

This effort is being coordinated with our increased shell fish protection activities and will be integrated with a long-term cumulative effects study.

B. Shell Fish Protection Program

Because of the importance to the economy and recreational pursuits of the state, DOE has put shell fish protection into a top priority program for use of a portion of Section 205(j) funds.

In mid-November, we will hold public workshops to discuss guidelines and priorities for use of these Federal funds. Under Section 205(j), funding from EPA will be approximately $418,000 for the year. The money will be used to identify and correct problems that have caused decertification or threatened decertification of commercial shell fish areas. We will combine these funds with about $50,000 of Coastal Zone Management funds which we received from NOAA.

D. Puget Sound Management Program

As you can see, there are many related efforts to control pollution in Puget Sound. Therefore, a DOE/EPA joint management program has been established to focus our resources on correcting problems and preventing future problems.

Our joint management contract with EPA will focus on:

1. conducting a cumulative effect study;
2. developing an ongoing monitoring strategy;
3. identifying other areas that need investigation; and,
4. coordination of monitoring, investigative, and enforcement activities.

The catalyst to bring the agencies together will be an Intergovernmental Personnel Agreement. We have engaged an EPA manager to work for us. This individual will head the Joint Management Team to direct our Puget Sound Program.

VI. FUTURE DIRECTIONS

Looking to the future, it is clear that we will need NOAA's research. However, it should not be completely independent of pollution control investigations. There needs to be a more comprehensive program of investigation and research. This type of work is far too expensive not to be integrated.

There are important questions that NOAA's research may help answer--such as which compounds cause which abnormalities in fish; what are the migratory patterns of bottom fish; and degree of damage to marine resources. Such research would assist public health agencies in assessing risks involved in bottom fish consumption. At the same time, the sampling and analysis could be of great help to us to locate the source of contamination and point to possible remedies.

2. Clean up and Control

Our biggest problem will be cleaning up from past practices of waste disposal. In some cases, these practices are documented and we can find the disposal sites and the contributors. Unfortunately, I'm sure we will uncover areas where we have no documentation and our investigative capabilities will be pressed very hard to provide solutions.

Many of the past discharges were in compliance with the law at the time. As the state-of-the-art in chemical detection and analysis advanced, more stringent limits have been incorporated into discharge permits.

This makes me reasonably confident that with RCRA, the Clean Water and Clean Air acts, CERCLA, and state programs, we will be able to control current and future sources of chemical contamination in Puget Sound. Remedying problems from past practices will be more difficult and will test the administration of those laws.

VII. CONCLUSION

Let me conclude by saying that our success will depend largely on the spirit in which we undertake the tasks that lie ahead.

The lessons learned in 1962 are applicable here. We see the total Puget Sound management issue as Round Two. However, we are much further ahead of the pioneering effort of 20 years ago.

The Joint Management Team has been formed and there is a spirit of cooperation and a willingness to share between all the agencies involved.

Technically, the state-of-the-art is more sophisticated. But, with this sophistication of techniques and equipment come newer problems.

Finally, there is no "state side" or "Federal side" in the project we are about to undertake. The most important thing is to keep all lines of communication open to the public, Congress, and the Legislature.

Thank you for giving me this opportunity to speak. I would be pleased to answer questions.

Attachment #1

CONFERENCE ON POLLUTION OF THE NAVIGABLE WATERS OF PUGET SOUND, THE STRAIT OF JUAN DE FUCA AND THEIR TRIBUTARIES AND ESTUARIES

Under the Federal Water Pollution Control Act, the Secretary of Interior could call a "conference" when requested to do so by the Governor of a state. Conferences were designed to bring together state and federal water pollution control agencies to jointly address pollution problems in specified areas.

Governor Rossellini requested the Puget Sound (P.S.) Conference November 22, 1961. At his request, a conference was held on the Lower Columbia in 1958. State and federal agencies were jointly studying pollution problems in Grays Harbor, but a conference was not held.

The first P.S. Conference was held January 16 and 17, 1962. A second was held September 6 and 7 and October 6, 1967. Both brought together the state Water Pollution Control Agency (now DOE) and Federal Water Pollution Control Administration (now EPA).

Purpose: "To review the existing P.S. situation, the progress which has been made to date, lay a basis for future actions by all parties concerned, and to give the state, localities and industries an opportunity to take any indicated remedial action under state and local law."

At the 1962 conference, state and federal agencies developed a joint program, "Washington State Enforcement Project," to evaluate the pollution impact on fisheries resources of pulp and paper mill wastes discharged into Puget Sound. The Project evaluated four geographic areas: Bellingham Bay, Port Angeles Harbor, Everett-area (Everett Harbor, Port Gardner, Snohomish River), and Anacortes (Guemes Channel, Fidalgo Bay). Eight sulfite pulp mills were located in these areas.

Four Study Categories:

1) economic evaluation of values of water uses to water resources;

2) in-plant surveys to determine quantity and composition of wastes discharged;

3) oceanographic and related studies to determine the distribution of wastes in P.S. and immediate receiving waters;

4) biological studies to determine the effect of discharges on marine life.

The Project conducted extensive studies with assistance from other state and federal agencies and major northwest universities. Studies took about four years. Governor Rossellini requested the 1967 conference to formally present the Project's findings and determine what actions would be taken.

Findings:

1) The four largest sulfite mills in P.S. discharged sulfite waste liquor in concentrations damaging to fisheries resources near the outfall and some distance away;

2) Bottom sludge from solids in the effluent contained toxic components harmful to fisheries resources;

3) Inadequately treated sewage from municipalities was polluting the Snohomish River, Bellingham Bay and Port Angeles Harbor.

Recommendations:

1) The four largest mills were required to design and construct facilities to remove 80% of the liquor from mill effluent or limit discharges to a specified level by September 30, 1972;

2) All mills were required to design and construct primary treatment facilities to remove all "settleable" solids from mill effluents prior to discharge by September 30, 1970;

3) Six mills were required to dredge sludge beds from waterways to which they discharged;

4) All mills were required to evaluate their receiving waters and place a new outfall in deeper water adjacent to the mill to achieve maximum dilution and dispersion by September 30, 1970;

5) Three mills were required to modify chipbarge unloading operations to eliminate spillage of wood chips no later than September 30, 1970;

6) The cities of Bellingham, Everett and Port Angeles were required to provide better treatment of domestic wastes in certain geographic areas using specific techniques. Each received a timetable for completion.

These recommendations could be enforced under the state's Waste Discharge Permit program.

SCOTT PAPER COMPANY MILL IN EVERETT

Current Production and Employment

The Scott mill in Everett produces 500 tons per day of sulfite pulp that is essentially all converted at the mill into tissue paper end products. About 1,200 people are employed in the pulp and paper making operations.

Water Pollution Abatement

Compliance with NPDES permit limitations was achieved in December 1979 through installation of a $25,000,000 bio-treatment facility and by shutting down a portion of the pulp production equipment. The effect of this change is tabulated as follows:

	Mar. 74 to Dec. 79	After Dec. 79
Pulp production, tons per day	750	500
BOD discharge, lbs. per day	350,000	10,000
Discharge flow rate, gallons per day	50,000,000	25,000,000

In March 1974, a $25,000,000 recovery system was installed to recover about 50% of the spent pulping liquor that was being discharged to Port Gardner. With the recovery system, BOD discharges were reduced from 700,000 lbs. per day to 350,000 lbs. per day.

Recent Enforcement Activity

In June 1980, EPA fined Scott $400,000 for failure to meet the 1977 deadline for best practicable treatment of wastewater.

DOE has assessed a few $250 penalties for effluent pH violations. Recent improvements in pH control are expected to produce satisfactory compliance with the 5.0 to 9.0 pH limitation.

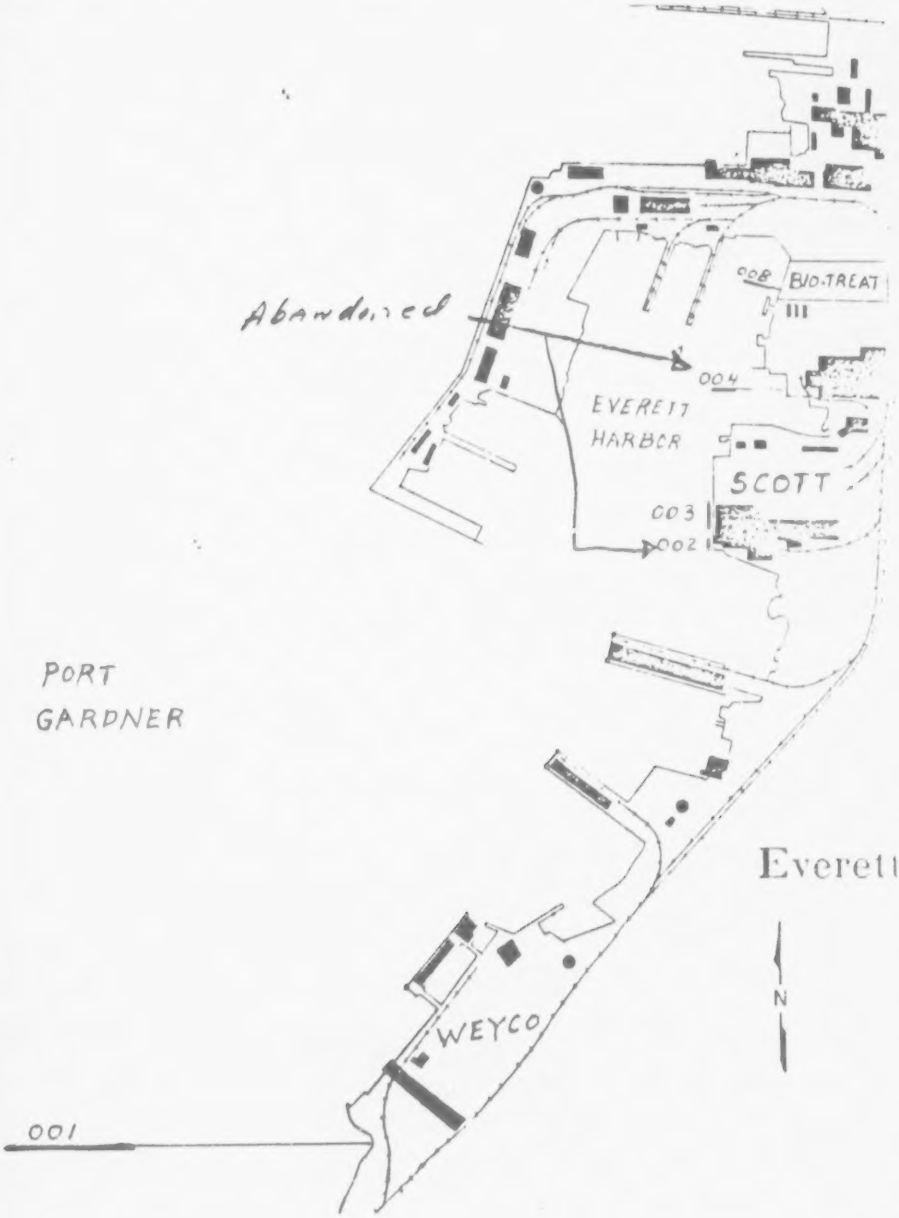
Bioassay monitoring by Scott showed that discharges through outfall 003 were toxic to juvenile salmon during 1981 and the first half of 1982. Cause of this toxicity was found to be zinc in scrap rubber tires that were burned as a fuel supplement in hog fuel boilers. Stopping the use of scrap rubber tire fuel in July of this year has apparently resolved the toxicity condition. The DOE toxicity guideline is stated in the Scott NPDES permit as a monitoring requirement rather than an effluent limitation. Therefore, no enforcement action was taken for the toxicity problem.

Air Pollution Control

In 1979, a $5,000,000 baghouse was installed for the hog fuel boilers, under PSAPCA jurisdiction. In 1974, a $3,000,000 air pollution control facility was installed for the recovery boiler, under DOE jurisdiciton.

History

1932	Soundview Pulp Company started the mill with 6 digesters and 300 tons per day of calcium base sulfite pulp production.
1937	An additional 6 digesters were added bringing production to 600 tons per day.
1951	Scott bought the mill. A deep water diffuser, outfall No. 001, was installed in a joint venture with Weyco for discharge of sulfite waste liquor (10% solids) from both mills. The discharge is through a 1,000 foot long diffuser section at a depth of 300 feet between 2,000 feet and 3,000 feet west of the Weyco mill site.
1953	Scott started the tissue paper mill. Pulp production increased to 750 tons per day.
1956	Six digesters, unit 1, converted from calcium to ammonia base.
1963	Sanitary sewer hooked up to city system.
1964	Installed primary clarification facilities.
1968	Remaining six digesters, unit 2, converted from calcium to ammonia base.
1974	Waste liquor recovery system installed for unit 2 digesters.
1979	Activated sludge bio-treatment facility installed and unit 1 digesters shut down. Bio-treatment plant effluent is discharged through a new outfall, No. 008, into the inner harbor. Waste bio-sludge is combined with primary sludge and burned in the hog fuel boilers. Outfalls No. 002 and 004 were abandoned.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Governor

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WEYERHAUSER PULP MILLS ON EVERETT HARBOR

Sulfite Mill - 1936-1975

The calcium base sulfite mill produced 300 tons per day of dissolving grade pulp with an employment force of 300 people.

With no waste liquor recovery, 300,000 pounds per day of BOD was discharged in 30,000,000 gallons of waste water. Most of this BOD was discharged through a deep water diffuser built in 1951 in a joint venture with the nearby Scott mill. The discharge of waste liquor (10% to 12% dissolved solids) from both mills was at a depth of 300 feet between 2,000 and 3,000 feet west of the Weyco mill. All other waste water from the Weyco mill was discharged at the mill site waterfront.

In 1972, Weyco announced that the sulfite mill would be closed because it was not economically feasible to install a waste liquor recovery system and other water pollution abatement facilities. Weyco subsequently announced construction of a thermo-mechanical mill to replace the sulfite mill in 1975.

Thermo Mechanical Mill - 1975-1980

At a cost of $20,000,000 a new thermo-mechanical (TM) pulp mill was placed in operation in 1975 after shut down of the sulfite mill. The TM mill was designed for a pulp production rate of 300 tons per day and a labor force of 130 people. Ancillary facilities of the sulfite mill, such as bleaching and paper making, were converted to use in the TM mill.

A $3,000,000 bio-treatment facility was constructed to reduce 30,000 pounds BOD per day from TM pulping to a discharge rate of 4,000 pounds of BOD per day. This discharge was through the deep water diffuser.

The TM mill was permanently shut down in December 1980 after a five year operation. The reason for the shut down was attributed by Weyco primarily to a failure in developing a market for the economy grade fluff-pulp product of the mill.

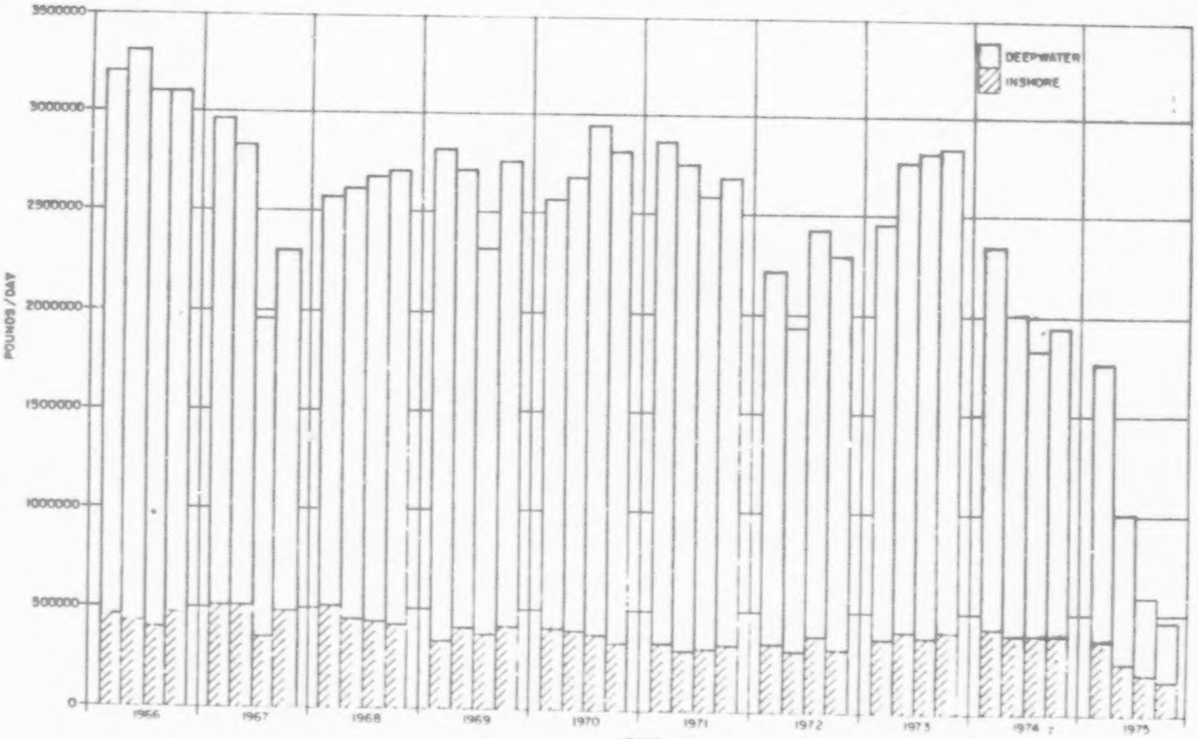
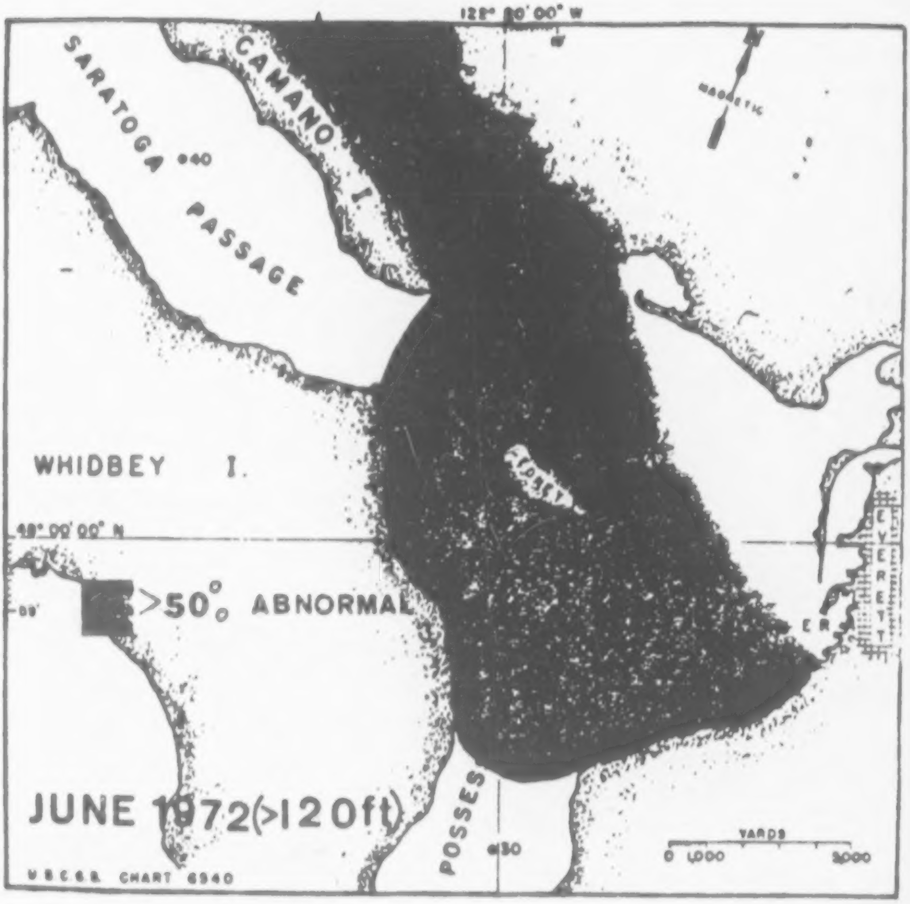


Figure 1. TOTAL SOLIDS DISCHARGED INTO PORT GARDNER AND ADJACENT WATERS BY SCOTT PAPER COMPANY AND WEYERHAEUSER THROUGH THE DEEP WATER DIFFUSER AND INSHORE OUTFALLS FROM 1966 THROUGH 1975.


122° 20' 00" W
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MAGNETIC
SARATOGA PASSAGE
CAMANO I.
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POSSES
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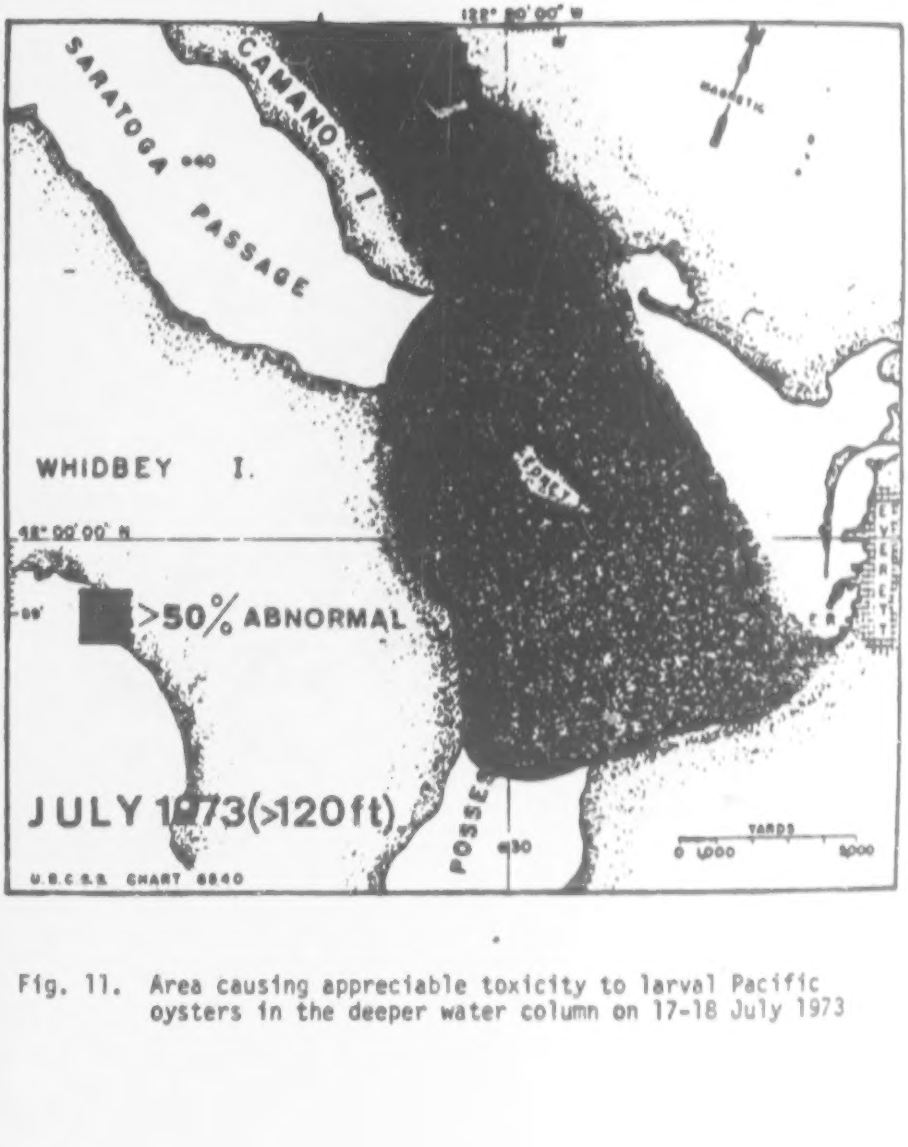
Fig. 10. Area causing appreciable toxicity to larval Pacific oysters in the deeper water column on 13-14 June 1972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YARDS
0 1,000 2,000
U.S.C.&G.S. CHART 6440

Fig. 11. Area causing appreciable toxicity to larval Pacific oysters in the deeper water column on 17-18 July 1973

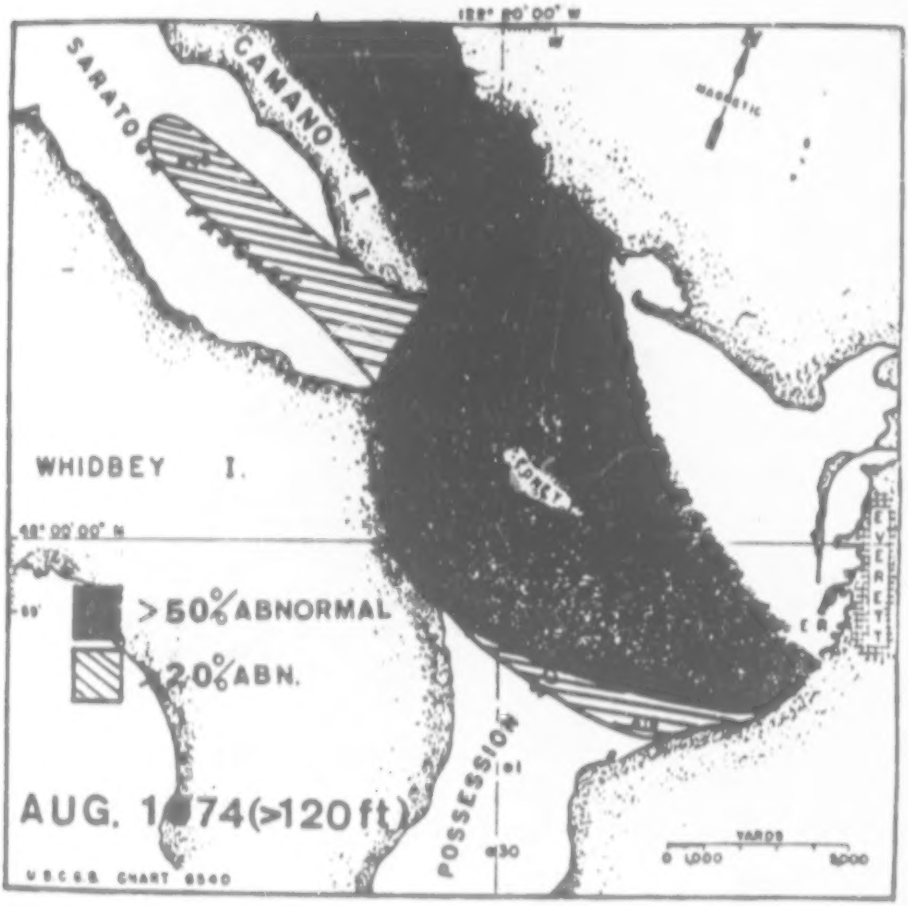

SARATOGA PASSAGE
CAMANO I.
WHIDBEY I.
48° 00' 00" N
122° 20' 00" W
MAGNETIC
GEDNEY
>50% ABNORMAL
>20% ABN.
AUG. 1974(>120 ft)
POSSESSION
EVERETT
YARDS
0
1,000
2,000
U.S.C.&G.S. CHART 6540

Fig. 12. Areas causing appreciable toxicity to larval Pacific oysters in the deeper water column on 20-21 August 1974

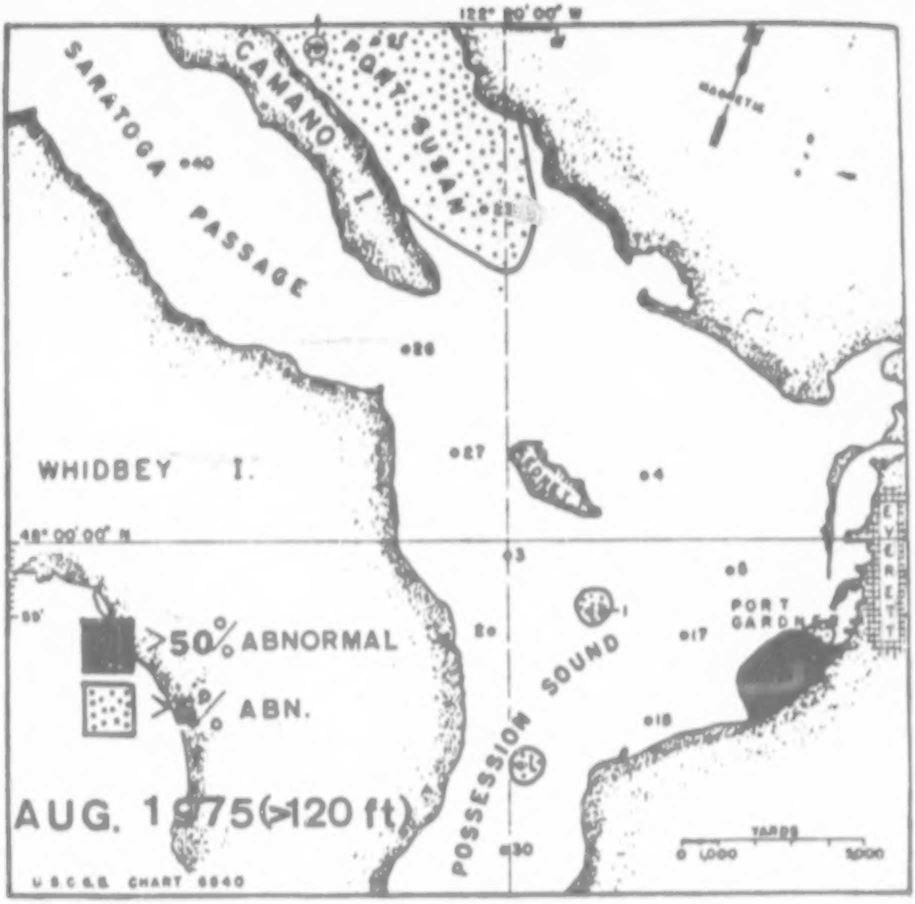

SARATOGA PASSAGE
CAMANO I.
PORT SUSAN
MAGNETIC
WHIDBEY I.
48° 00' 00" N
50'
>50% ABNORMAL
ABN.
AUG. 1975 (>120 ft)
U.S.C.&G.S. CHART 6840
40
22
26
27
4
3
8
1
17
2
18
30
GEDNEY
EVERETT
PORT GARDNER
POSSESSION SOUND
YARDS
0
1,000
2,000

Fig. 13. Areas causing appreciable toxicity to larval Pacific oysters in the deeper water column on 18-19 August 1975

(Extracted from WDOE
"Concept Plan for Shellfish Protection"
August 18, 1982)

LOCATION AND SIGNIFICANCE OF RESOURCES

In this analysis, shellfish are classed into four groups:

- Oysters
- Clams (intertidal and subtidal)
- Geoducks
- Mussels (and other types of floating aquatulture)

Commercial shellfish resources are located throughout the Sound and the coastal bays, but are clearly concentrated on the coast, the South Sound and Central Sound. The following chart gives a general indication of the significance of these regions, except that mussel culture is still very limited (4 or 5 operations statewide).

Relative Production by Major Areas

	Oysters	Clams	Geoducks	Mussels
North Sound (Anacortes north)	*	*	-	*
Central Sound (Anacortes to Pt. Defiance & North Hood Canal, Disc. Bay, Sequim Bay)	***	****	****	*
Southern Sound (Pt. Defiance south & South Hood Canal)	****	****	****	*

There are some other significant geographical factors specific to each species.

Oysters

Willapa Bay is the largest producer in Washington and on the West Coast. However, South Sound production equals 58% of the Willapa output (averaged over last five years), while total Puget Sound production equals 82% of Willapa.

Clams

Intertidal hardshell clams are found mainly in South Puget Sound, Hood Canal, Discovery Bay and Sequim Bay. Subtidal hard-shell clam resources are located primarily in Jefferson County, Kitsap County and Island County. Hard-shell clam production comes almost entirely from Puget Sound (98%). Softshell clam resources are located primarily in Skagit Bay, Port Susan, Grays Harbor and Willapa Bay.

Soft-shells are not currently harvested to a significant extent (19,716 lbs. in 1979), but WDF has estimated the potential sustained yield at Skagit and Port Susan alone at 594,050 lbs. per year.

Geoducks

Geoduck beds are located throughout central and southern Puget Sound with 40% of the entire resource located in Kitsap County. They are commercially harvested from depths of 18 ft. to 60 ft. The management plan calls for an annual harvest of 5 million pounds from carefully selected beds. The rotation period for each bed is 30 years.

Value of the Shellfisheries

The clam fisheries (oyster, hardshell clams and geoducks) account for an average of 37% of the total shellfish production with shrimp and crab accounting for the majority of output. The value of the clam/oyster fishery is 42% of the total value of shellfish or $10,066,355 averaged for 1979 and 1980. This figure represents 9% of total fisheries' value for those two years. For 1979 (the only year for which figures are available) clam and oyster industry employment peaked a 802.

Recreationally, in Puget Sound 1,367,200 lbs of clams are dug annually in 441,00 user trips. The peak recreational use month on the beaches is May--conciding with the best clam tides. Commercial decertification means that the recreational resource is also endangered. Recreational digging has been seen to take place in areas decertificed for commercial harvesting.

The value of clam harvesting, however, transcends the economic data. Shell-fish, due to their collection and concentration of micro-organisms, are a valuable indicator organism for water quality conditions. The decertification of commercial shellfish grounds has been and may continue to be a sobering marker of the advance of urbanization and population growth around Puget Sound.

Future Aquaculture Production

Existing commercial shell-fish operations, represent only a fraction of the potential production of Puget Sound. According to WDF, if floating aquaculture (as it is beginning to be practiced in Mussel culture) developed in 1.2% of the waters south of Deception Pass, the annual harvest would be about 510 million pounds per year. This represents almost triple the total fisheries harvest of all species from all Washington waters in 1980 (186,013,589 lbs).

Although it is unlikely that this level of aquaculture development will occur in Puget Sound due to the multiple uses of the waters, development up to even one fourth of this productive capacity would still be a tremendous resource.

Consequently, it should be kept in mind that while the proposed policies are formulated to protect existing operations, similar considerations must be given to areas with high potential that are presently underdeveloped. There are many other areas not utilized for traditional intertidal culture and not specifically mentioned in this plan that are highly suitable for various forms of floating aquaculture and need protection also.

HISTORY OF SHELLFISH CLOSURES

In order to protect public health, DSHS must certify that any area used for commercial shellfish production is not polluted. They do not perform this service for sport shellfishing; that is a local health department responsibility. DSHS closures occur when the water quality or shellfish tissue exceeds the permitted coliform levels. Closures generally occur in the vicinity of marinas, heavily used boat traffic areas, sewage discharges, and urban areas. The extent of the closed areas depends both on the data obtained and a judgement factor for a margin of safety.

Areas are decertified if they have once been certified for production and then polluted. Another larger area can be considered "non-certifiable" where commercial production has not previously occurred, but is now precluded.

The non-certifiable areas became particularly evident in the 1970's when WDF discovered the extensive geoduck resource. After discussions with DSHS it became evident that numerous geoduck beds could not be harvested due primarily to sewage contamination. The major decertified and non-certifiable areas are listed below.

Decertified Areas

Location	Cause
Port Susan - about 1/3 of the tideflats	Dairy run-off in the Stillaguamish
Dyes Inlet - all	Bremerton S.T.P.
Sinclair Inlet - all	" " " "
Oakland Bay - about 1/5 of area nearest Shelton	Shelton S.T.P., Mill
Hammersly Inlet - about 1/2 extending out from Shelton	Shelton S.T.P., Mill
Liberty Bay - east side, around Poulsbo	Poulsbo, S.T.P., Marina
Burley Lagoon - all	Non-point
Minter Bay - all	Non-point
Grays Harbor - about 1/4, basically the eastern lobe	S.T.P.'s, mills
Willapa Bay - about 10%, roughly west of the North River	Raymond, South Bend S.T.P.'s
Sequim Bay - subtidal beds at mouth	Marina, boat traffic.
Harstene Island, north end	Recreational development, S.T.P.

Uncertifiable Areas - based on urban areas and geoduck beds	Cause
Bud Inlet, south of Burfoot Park	Olympia S.T.P, Deschutes River
Commencement Bay, north almost to Mukilteo (about 50 miles)	S.T.P.'s industrial, non-profit
Port Townsend	S.T.P.
Kitsap - near Winslow	S.T.P.
Appeltree Cove - near Kingston	Sewage outfall
Port Gamble	Sewage outfall
Blaine.	Hardshell bed dredged out for marina
Johnson Point	Marina
Everett	S.T.P. industry
Bellingham Bay	S.T.P. mills

This list may not be exhaustive, but it clearly shows the significantly large area closed to shellfish production and the need to preserve the remaining areas. Historically, the best areas for shellfish culture have coincided with the least developed areas of the Sound. (Clams in South Sound and Discovery Bay areas, and Olympia oysters in the South Sound). By the time Pacific oyster culture started (1930's), the urbanized areas to avoid were obvious. The exception to this is the Kitsap Peninsula as shown by the three decertified bays there.

Threatened Areas

The two-day evaluation of shellfish contamination problems and threats produced an impressive list of areas that are threatened to various degrees. The following is a very brief summary of these findings.

The evaluations covered 9 counties and identified 15 areas that have significant enough problems to warrant attention.

Those areas can be grouped however according to the type of problem that is occurring and different approaches that are needed to respond to the problems.

1. Areas most likely to experience general urban/suburban growth with accompanying storm drainage, run-off, septic installations and possible STP outfalls, with poor soils exacerbating the problems.

   Eld Inlet
   Henderson Inlet
   Liberty Bay
   Grays Harbor (near Ocean Shores)
   Willapa Bay (off the Long Beach Peninsula)

2. Areas with poor soils and subject to high shoreline growth rates, moderate overall growth, and development along creeks and watersheds draining to the marine headwaters. Poor drainfield performance, erosion, and animal keeping are the threats.

   Skookum Inlet
   Totten Inlet
   Case Inlet (Allyn area)
   Sequim Bay
   Smilk Bay
   Penn Cove
   Southern/Eastern Hood Canal
   Dungeness Bay

3. Areas that are presently closed but may be able to be re-opened.

    - Burley Lagoon
    - Minter Bay
    - Dyes Inlet
    - Port Susan

A major conclusion of this analysis is that the remaining culture areas of the Kitsap peninsula and the Olympia region are the most threatened. This is reinforced by the recent closures in Pierce County. Great care will be needed to avoid a future Dyes Inlet or Burley Lagoon in the productive South Sound area.

Another major conclusion to be drawn from the above list is that non-point pollution similar to the problems occurring in Burley Lagoon and Minter Bay is the major threat to these culture areas if sewage treatment outfalls are restricted. Since permits are issued for such point discharges they are administratively, although not politically, easier to control. Non-point run-off from faulty drainfields and small-scale animal farms, however is generally not noticed till the problem becomes severe. Controlling it is difficult, but imperative if the threatened areas are to continue thriving.

Grays Harbor and Willapa Bay are unique. Due to their size, industry shellfish and cities have generally be able to co-exist. Some special problems exist in Ocean Shores and Long Beach where the high potential growth rates and the sandy soils could lead to contaminants leaching into the bay either directly or via the waterways.

The final conclusion to be drawn from this list is that all shellfish areas are somewhat threatened, even when they are well removed from urban centers. Relatively undeveloped culture areas in northern Hood Canal or Discovery Bay can still experience decertification from a large recreational development, a marina, or an industrial development.

Environmental laws have produced some successes with regard to shellfish. The decertified area in Oakland Bay, was reduced by about 1/3 when the Shelton STP was upgraded and the mill discharges were treated. Significant amounts of clams and oysters are now grown in previously decertified areas. But if non-point sources are masked by the STP, there could be a persistent problem. An example is Dyes Inlet, closed due to the Bremerton STP discharge into the Washington Narrows and an outlet at Silverdale. The Bremerton outfall is scheduled to be moved to Sinclair Inlet and the Silverdale STP discharge has already been moved to Port Orchard. A 4000 unit development, however, is being planned adjacent to Silverdale. Stormwater discharge from this development could very well contain sufficient coliform to still prevent Dyes Inlet from being re-opened.

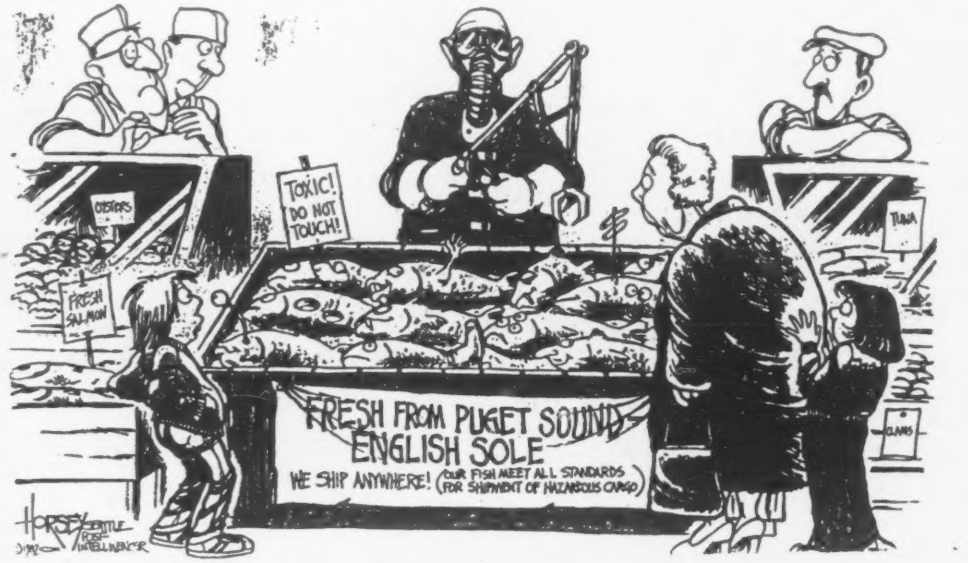
Reversing non-point type pollution appears to be a significant problem. After 1½ years and a considerable amount of sanitary surveying and corrections of identified problems Burley Lagoon is still contaminated. Minter Bay likewise remains contaminated even after some obvious sources have been corrected.
The conclusion from these (Burley and Minter Bays) is to prevent the problem rather than wait until it occurs.

Joint Hearing of the U.S. Senate Committees on Commerce, Science and Transportation and Environment and Public Works: "TOXIC CHEMICAL POLLUTION IN PORTIONS OF PUGET SOUND"

STATEMENT BY: STEPHEN L. CHASE

My name is Stephen Chase. I am Executive Director of Northwest Fisheries Association, a trade association of seafood processors in Washington and Alaska, and for 35 years I operated a filleting plant on Everett's waterfront. We appreciate having been invited to this meeting.

Our concern in these hearings is the damage done to the image of seafood. Many of you are familiar with the cartoon in Seattle's Post Intelligencer which appeared in conjunction with the reporting of Dr. Malin's findings, and which I reproduce here:


OYSTERS
TOXIC! DO NOT TOUCH!
FRESH SALMON
TUNA
CLAMS
FRESH FROM PUGET SOUND ENGLISH SOLE
WE SHIP ANYWHERE! (OUR FISH MEET ALL STANDARDS FOR SHIPMENT OF HAZARDOUS CARGO)
HORSEY SEATTLE POST INTELLIGENCER

I am confident that all in this room know that this cartoon and some of the headlines suggesting similar horrors are contrary to the facts. Dr. William Aron, Director of the NOAA laboratory sponsoring the study on September 28, 1982 wrote the editor of the Seattle Post Intelligencer a letter from which I quote:

"English sole and all other fish species examined which were caught in areas of Puget Sound away from these urban embayments are essentially healthy and highly edible fish. I wish to emphasize that the commercial fishing areas of Puget Sound are not in the highly polluted urban waterways and industrialized estuaries".

"To sum up the situation, absolutely no evidence exists that these disease problems occur with fish and shellfish sold through commercial markets. These commercially marketed species, including English sole, are obtained primarily from areas removed from known sources of pollution. All present evidence reaffirms, therefore, that commercially marketed fish are safe to eat and remain a well-balanced and rich source of protein and other nutrients".

Also Dr. Thomas English of the University of Washington Oceanography Department has made an in-depth study of the commercial fisheries in Port Gardner Bay extending over several years and states categorically, "The appearance of fish taken in Port Gardner was similar to healthy fish taken elsewhere in Puget Sound." To further emphasize the distance between the embayment studied by NOAA and the commercial fishing areas of Everett, I call your attention to this government chart. The commercial zone for crab commences two miles from the inner harbor and the closest bottom fish trawling is over a mile distant.

Very large sums are spent to improve the image of seafood in the public mind - as one example Alaska Seafood Marketing Institute has just appropriated 6.9 million dollars for promotion for next year. And you can appreciate what a burden it is for our industry, beset by difficulties, to come up with these huge sums which we consider essential to our marketing. It is crushing for the people who have worked diligently on these programs to see their work negated by unfortunate and erroneous publicity. We trust that your committees participating in these deliberations as well as the media will emphasize that the high quality of Puget Sound commercially caught seafood has not been questioned in Dr. Malin's reports.

The pollution situation in Everett Harbor has vastly improved. I fished crabs commercially in Port Gardner during the great war, and we could not see objects two feet below the water surface. Now I am a sports crab fisherman and when the river is not high and heavily silted, we frequently see our pots on the bottom 12 to 18 feet down and can watch the crab moving inside them. During the past decade the citizens and industries of Everett have spent over 100 million dollars in expenditures to improve the water quality of Port Gardner Bay, including two major projects by Scott, two by Weyerhaeuser and the City of Everett's sewer lagoon. We in the seafood industry recognize and salute the progress being made and the jobs being supported.

NORTHWEST PULP AND PAPER ASSOCIATION

COMMENTS
TOXIC POLLUTION OF PORTIONS OF PUGET SOUND
OCTOBER 25, 1982 - SEATTLE

Todays field hearing by the Senate Commerce Committee and the Senate Environment and Public Works Committee on toxic chemical pollution of portions of Puget Sound touches a broad issue of great concern to all residents of the region. The Northwest Pulp and Paper Association (NWPPA), which represents the majority of the pulp and paper producers in the Northwest, is particularly concerned with this issue as six of our member mills are located in the Puget Sound area. The pulp and paper industry is most anxious to add any information which we possess about our processes, pollution control efforts and capabilities as well as industry research findings which may be helpful to the committee's inquiry.

The subject of toxic chemicals in any context tends to generate a great deal of emotionalism and pressure to "do something" and to find quick and easy answers. When a resource such as the Puget Sound is affected, the pressures can be even greater.

In this context, the pulp and paper industry would like to urge caution and that scientists, regulators and the regulated community develop a better understanding of the factors and causal relationships affecting the Puget Sound before we come to quick conclusions or easy answers.

The pulp and paper industry's recent experience with just one chemical substance cited in one recent research study illustrates the complexity of the problem. A recent NOAA study has received considerable exposure in the local press and has been brought to the attention of the Senate committee members. This study found a high rate of liver cancer in English sole caught in the urban harbors of Puget Sound. The highest cancer rate (84%) was identified in Everett harbor on the basis of a sample of 32 fish. These dramatic findings were based on preliminary studies which indicated that many factors could be responsible; however one of the chemicals implicated, retene, is also associated with pulp mills. These findings placed the pulp and paper industry in a considerable dilemma because so little is conclusively known about the chemical retene, its effects, and the causal relationship to problems in the Puget Sound. Some of the areas of uncertainty include:

First, English sole, as any creature which lives in close proximity to the sediments of urban harbors, will be especially affected by pollution loading of the sediments. However, the use of English sole as an indicator of environmental pollution is problematic as this species tends to show a high rate of cancer and cancerous skin lesions even in pristine areas. This phenomenon has been well documented in bottom fish for 40 years, with some of the earliest studies going back to the turn of the century. English sole has been known to show as high as 58% rate of cancerous skin lesions in pristine areas although less work has been performed on liver cancer in pristine areas. In addition to causes associated with pollution, other factors known to cause a high rate of cancer in English sole include viruses, parasites and physiological stress associated with natural physical changes in the water.

Secondly, the pathways by which retene could be deposited in Puget Sound sediments are numerous and include several pathways other than as a direct result of effluent from the pulp and paper industry. It is probable that retene will be found wherever there is exposure of water to wood. All wood contains some resin acid which is a precursor of retene and which tends to leach from log storage areas or wherever woody matter is naturally deposited in waterways. Also there are preliminary studies of sediments in southern Puget Sound which are deposited by streams which are not affected by industrial effluent or urban runoff which, nevertheless, show higher retene levels than found in urban harbors. Tentatively it appears that some of these streams carry runoff from coal bearing strata. The coal would be formed from animal and vegetative sources including vegetation which contained resin acids. Thus, there appears to be a clear possibility that there is a natural pathway for retene to become deposited in sediments.

Nevertheless, the pulp and paper industry has initiated efforts to determine if retene is present in effluent reaching the Puget Sound from our mills. Preliminarily, it appears not to be present in our effluent although additional testing is being performed in an attempt to identify the presence of retene. Some work performed in the south and southeast indicates that a few parts per billion of retene can be found in the effluent of mills using southern pine (which contains more resin acid precursors than Douglas fir).

A third major area of uncertainty involves the characteristics of retene. Retene is toxic and has been recommended for study to determine if it is also carcinogenic; however, the findings are not complete in this respect. The pulp and paper industry has sponsored research on artificially created cold and warm water streams in order to study the effects of our effluent on fish. Stream fish have been exposed for up to one year to water which is 25% pulp mill effluent. These fish did not develop cancer even at levels of exposure which far exceed that which a fish would encounter in the vicinity of a pulp mill.

Since 1977, the pulp and paper industry has been required to control its major pollutants and significant toxic substances. No control for retene has been required to date because state-of-the-art analytical techniques have not shown it to be generally present. In the limited instances where it has been found in the south and southeast, it has been found at concentrations below that for which regulations can be developed. Since the installation of required treatment systems, the mills in the Puget Sound region have been in compliance with all federal and state requirements. There have been no violations or any other types of incidents associated with these mills.

The experience of one industry with one chemical tentatively identified in one preliminary study receiving wide media exposure is nevertheless a small part of the total picture involving the Puget Sound. Yet, our story could be multiplied by as many industries and as many chemicals as are known to be present in the Puget Sound region. It is important to keep in mind that as our analytical tools become more advanced, we will be able to identify more chemicals at lower and lower levels. Our abilities to identify chemicals will continue to outstrip our abilities to determine causes and effects of such chemicals in the environment. Again, we hope our experience illustrates the need to firmly understand cause and effect relationships before proceeding to quick conclusions and easy answers.

Northwest Indian Fisheries Commission

STATEMENT OF
NORTHWEST INDIAN FISHERIES COMMISSION
BY
BILL FRANK JR., CHAIRMAN

Presented Before the
U.S. Senate Committees of
Commerce, Science and Transportation, and
Environment and Public Works

Toxic Chemical Pollution
in Portions of Puget Sound Hearing

October 25, 1982
Seattle, WA

Good afternoon, Chairmen Bob Packwood and Robert Stafford and other members of the United States Senate Commerce, Science and Transportation, and Environment and Public Works Committees. I am Bill Frank Jr., Chairman of the Northwest Indian Fisheries Commission, which coordinates and represents the fisheries management policies and habitat-protection concerns of the treaty Indian Tribes of Western Washington.

The Tribes of the Pacific Northwest greatly depend on fish and other natural resources from the streams and marine environment to sustain their way of life. They developed specialized techniques for harvest and storage that enabled them to utilize salmon and steelhead as their most important food sources throughout the year. In addition, fish were and continue to be central to Indian religious beliefs and a number of ceremonies are celebrated to welcome and honor salmon and steelhead.

Fishing was so important to Indians that during the treaty signings in the 1850's, the right to continue this activity in their usual and accustomed fishing areas was specifically reserved and not transferred to the United States. These treaties are binding legal agreements that obligate the Federal government to protect the Tribes' right to continue taking fish at their usual and accustomed fishing areas. They also guarantee that there will be a continuing supply of fish to harvest.

Treaties between the United States and the Tribes further guarantee fisheries habitat protection. The U.S. District Court has ruled that the State and Federal governments cannot permit or participate in projects potentially damaging to the fisheries resource and habitat. The burden of proof is initially on the State to demonstrate that any action will not diminish a fish run or adversely impact the environment.

Puget Sound waters must not be viewed as a commodity to be exploited and abused. From a report by the National Oceanic and Atmospheric Administration (NOAA), it is evident water quality is deteriorating and that our waters have become chemical dumping grounds endangering fish and the health of the people utilizing fish from Puget Sound.

The health of fish are indicative of the health of our waters. Salmon and steelhead spend a significant portion of their life history feeding and rearing in the estuaries of Puget Sound. This critical time period in their life cycle, and ultimate survival is dependent on the water quality of these bays and estuaries. Unexplained fish kills have occurred in parts of Puget Sound thus showing that the impact of pollution in regard to fish is not always visible.

Fish have become affected by pollutants that have caused such problems as tumors, fin erosion and abnormal blood cell counts. These fish have become contaminated to the point that the public must be warned against eating them. From evidence in other parts of the United States, such as the Great Lakes region, fish that are affected by polluted waters are not fit for human consumption.

To ensure protection of our fishery resources and that the quality of life we all enjoy is maintained, the following concerns should be incorporated into further actions on the impact of man's activities in Puget Sound:

1. All areas of Puget Sound must be examined. Further studies should be designed to determine the location of pollution problems, to identify the types of pollutants and look into the extent of migration of toxins throughout Puget Sound.

2. Studies are necessary to obtain knowledge of the cause-and-effect relationship between the various chemicals dumped into Puget Sound, their subsequent combinations and the occurrence of diseases in marine organisms.

3. Funding must be appropriated and allocated for these studies, and for implementation and maintenance of resulting necessary clean-up programs.

4. Continuous monitoring of Puget Sound's water quality is necessary to maintain a healthy environment. The current Administration's goal, it appears, has been to weaken the ability of the various Federal agencies involved in environmental protection to effectively monitor and regulate water quality. This trend must be reversed through Congressional action to strengthen our ability to protect water quality.

5. Current or planned studies by other Federal, state and local agencies should be coordinated to ensure that all aspects of research complement rather than duplicate each other. To our knowledge, in addition to NOAA continuing its study of Puget Sound, the U.S. Environmental Protection Agency (EPA) in conjunctior with the Washington State Department of Ecology is also planning research.

There are many choices available for us to make in regard to our environment. However, the consequences of our actions must be scrutinized. The tradeoffs cannot be justified: Are we to jeopardize water quality by causing irreversible damage while promoting industrial development in Puget Sound? This alternative guarantees that we and our future generations will suffer the result of unchecked actions leaving the harmful effects of eating diseased fish, ruining the recreational fishery, and ensuring the overall destruction of Puget Sound waters upon which the Tribes' economy and life style depend. The Tribes know that the obvious solution is to effectively monitor, limit and control activities affecting water quality so that Puget Sound can be protected.

We further believe that it is imperative that fishery concerns always be addressed in relation to the Federal government's treaty obligations to the Tribes of the Pacific Northwest. The Tribes are also responsible for what happens to the fishery resources and environment in their roles as natural resource managers.

The member Tribes of the Commission are pleased that Congress is acting to address the problem of water quality in the Pacific Northwest. Apparent in the work done by the NOAA and planned by the EPA is that Congress views this concern as a Federal responsibility. Money is needed for research, prevention of further activities that threaten water quality and for clean-up programs to reverse the current downward trend. The waters of Puget Sound can be restored to historic fisheries production capacities. We believe the maintenance and improvement of water quality ensures that fisheries will remain as an important economic base in the Pacific Northwest.

The Northwest Indian Fisheries Commission and our member Tribes thank you for inviting us and listening to our testimony today.

SUBMITTED BY BUD NICOLA

TOXIC CHEMICAL POLLUTION OF PUGET SOUND HEARING

TACOMA-PIERCE COUNTY HEALTH DEPARTMENT TESTIMONY

Chemical pollution of Puget Sound poses a big question to public health officials: What risk is there to human health?

The question was raised in the fall of 1980 in Tacoma when a National Oceanic and Atmospheric Administration (NOAA) Study uncovered liver tumors in bottomfish. A task force of agencies has been meeting periodically since the 1980 study to pool information from a variety of different studies and to give a common direction for research efforts. In Commencement Bay it would appear that we are very close to defining the actual risk to human health from eating a specific species of bottomfish or shellfish caught in a specific location in the Bay.

During the summer and fall of 1981, the Tacoma-Pierce County Health Department ran a fish/crustacea catch consumption study. The study determined the amount and species of fish consumed and the demographic characteristics of Commencement Bay fishermen. The next step was to measure edible fish tissue from the same species of fish for organic and metallic pollutants and compare these results with similar species caught at a reference station, Discovery Bay. The Environmental Protection Agency (EPA), Region 10, is in the final review stages of this study data. This information, when released in the near future, will allow the Health Department to inform the fishing public of the level of health risk from organic compounds and heavy metals and, if risks are high, to take further steps to protect the public.

Other locations in the Sound have recently been determined to have similar lesions in fish. I would suspect that each area has a different level of heavy metals and organic chemicals so that the actual health risk will be specific to that particular location. It may be that after several other areas are examined in detail, a general statement may be possible about the level of health risk in heavily industrialized areas of Puget Sound; I do not believe that such a statement is possible at this time. A group of local and state health officers will be meeting in the near future to discuss the health risk issue.

Human health standards for exposure to toxic chemicals are based on animal models or on epidemiologic studies of people exposed to the substance of concern. Human health standards are established for acute toxicity, ingestion of a large amount at once, and for chronic toxicity, adverse health effects such as cancer induction from low levels over a long period of time.

The amount of chemical such as polychlorinated biphenyl (PCB) found in the fish analyzed in the NOAA studies has been far below the Food and Drug Administration's action levels (Appendix B). Action levels are not established, however, for most of the heavy metals and organic chemicals that are now being tested for in fish tissue. Interpretation of data when there are no established human health standards is inexact and speculative at best.

An outline of the major findings of the Tacoma-Pierce County Health Department's "Commencement Bay Seafood Consumption Study" is attached for your information (Appendix A).

APPENDIX "A"

TACOMA-PIERCE COUNTY HEALTH DEPARTMENT
MEMORANDUM

To:	Mayor Doug Sutherland	From:	Bud Nicola, M.D.
Subject:	Summary of Commencement Bay Fishermen Study	Date:	March 24, 1982

Objectives:

To determine which fish/crustacea are used for food, how much is eaten, and the potential risk from eating fish from Commencement Bay.

Data Collection:

Researchers interviewed successful fishermen about age, sex, race, size of living group, place of residence, fishing frequency and planned use of their fish; fish were weighed and identified. One week later the fishermen were contacted by phone and asked if they had eaten the fish and, if so, if there were any problems such as distaste, discoloration or parasites.

Results:

1. Distribution of fish catch:
   a. 99.8% of the fish were caught on the southwest side of the bay; Point Defiance Boat Ramp--59.9%, Point Defiance Pier--25.4%, Old Town Dock--9.1%, City Waterway--5.5%.
   b. 37 distinct species of fish were caught: Pacific Hake and Walleye Pollock accounted for 69.3% of the total as measured by gross weight; by including Pacific Cod and Pacific Tomcod we can account for 79.4% of the catch.
   c. Japanese Red Rock Crab and Dungeness Crab were the two types of crustacea caught; 34.4% taken from the Blair and Hylebos Waterways, 52.9% from the City Waterway.
2. Who is affected:
   a. Racial composition: White--58.9%, Black--22.7%, Oriental--15.5%, Mexican--2.6%, Puyallup Indian--.3%.
   b. Age--first half when school was out: 0-15 (17.1%), 15-30 (37.8%), 30-50 (36.9%), Over 50 (8.2%); second half after school vacation was over: 0-15 (2.9%), 15-30 (37.8%), 30-50 (40.7%), Over 50 (18.6%).
   c. Sex: 85.9% male, 14.1% female.

d. Residence: 78.8% lived in Tacoma; of the 21.2% who did not live in Tacoma, 82.8% indicated they did live within Pierce County.

e. Average family unit--3.5 members.

f. 99% of the catch was intended for human consumption (95% indicated they intended to eat the catch).

g. Fishing frequency: consistent despite the deterioration of the weather in the fall; daily fishermen--9%, weekly fishermen--51%, monthly fishermen--17%, bi-monthly fishermen--4%, annual fishermen--10%.

h. Average number of fishermen per day: 60.2 (excluding the Boat Ramp).

Next Step:

Completion of EPA measurements of toxicants in edible fish tissues to compare fish species with sites and amounts of fish caught; the end result will allow us to project the health risks of eating fish at different sites in Commencement Bay. Final EPA data is expected in April, 1982 and a final report will be issued by June, 1982.

APPENDIX "B"

ACTION LEVELS FOR POISONOUS OR DELETERIOUS SUBSTANCES IN HUMAN FOOD AND ANIMAL FEED

Action levels for poisonous or deleterious substances are established by the Food and Drug Administration (FDA) to control levels of contaminants in human food and animal feed.

The action levels are established and revised according to criteria specified in Title 21, *Code of Federal Regulations*, Parts 109 and 509 and are revoked when a regulation establishing a tolerance for the same substance and use becomes effective.

Action levels and tolerances represent limits at or above which FDA will take legal action to remove adulterated products from the market. Where no established action level or tolerance exists, FDA may take legal action against the product at the minimal detectable level of the contaminant.

Action levels and tolerances are established based on the unavoidability of the poisonous or deleterious substance and do not represent permissible levels of contamination where it is avoidable. The blending of a food or feed containing a substance in excess of an action level or tolerance with another food or feed is not permitted, and the final product resulting from blending is unlawful, regardless of the level of the contaminant.

This booklet lists action levels established by the FDA for poisonous or deleterious substances in human food and animal feed. The list is current as of July, 1980. Notices will be published in the *Federal Register* as new action levels are established or as existing action levels are revised or revoked. It is the responsibility of the user of the list to keep up to date on changes in the action levels.

Single copies of this list are available from:

Food and Drug Administration
Industry Programs Branch
Bureau of Foods (HFF-326)
200 C Street, S.W.
Washington, D.C. 20204
Phone (202) 245-1523

Copies of the Administrative Guidelines (AG) and Compliance Policy Guides (CPG) referenced in the action leve list may be obtained from:

Food and Drug Administration
Freedom of Information (HFI-35)
5600 Fishers Lane
Rockville, Maryland 20857
Phone (301) 443-6310

Other references in the action level list are filed under Docket No. 77N-0166 for public viewing at:

Food and Drug Administration
Hearing Clerk's Office (HFA-305)
5600 Fishers Lane
Rockville, Maryland 20857
Phone (301) 443-1753

For further assistance or information contact:

Food and Drug Administration
Guidelines and Compliance Research Branch
Bureau of Foods (HFF-312)
200 C Street, S.W.
Washington, D.C. 20204
Phone (202) 245-3092.

FDA ACTION LEVELS

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Arsenic 900 ug/g per day from CDC Atlanta

*Indicates revision since September 1, 1979.

FDA ACTION LEVELS

AFLATOXIN

Commodity	Action Level	Reference
Brazil nuts	20.0 mcgs/kg	AG 7412.01
Foods and feeds	20.0 mcgs/kg	AG 7420.01
Milk	0.5 mcgs/kg(aflatoxin M_1)	AG 7406.06
Peanuts & peanut products	20.0 mcgs/kg	AG 7412.03
Pistachio nuts	20.0 mcgs/kg	AG 7412.05

ALDRIN & DIELDRIN

The figures below are for residues of the above pesticides individually or in combination. However, in adding amounts of aldrin and dieldrin do not count aldrin or dieldrin found at a level below 0.03 ppm for nonfatty foods and 0.3 ppm for fish and for milk.

Commodity	Action Level	Reference
Animal feed, processed	0.03 ppm	AG 7426.04-A
Artichokes	0.05 ppm	AG 7420.08-A
Eggs	0.03 ppm	AG 7420.08-A
Fats & oils: animal, vegetable fish (animal feed)	0.3 ppm	AG 7426.04-A
Fish and shellfish	0.3 ppm	AG 7420.08-A
Figs	0.05 ppm	AG 7420.08-A
Hay (animal feed)	0.03 ppm	AG 7426.04-A
Melons[1]	0.15 ppm	AG 7420.08-A
Milk and dairy products	0.3 ppm (fat basis)	AG 7420.08-A
Small fruits[1,2]	0.05 ppm	AG 7420.08-A
Sugarbeet pulp (animal feed)	0.1 ppm	AG 7426.04-A

[1] Other than those commodities specified in 40 CFR 180.135 and 180.137.

[2] Refer to 40 CFR 180.34(f) for commodities covered by this food group.

BENZENE HEXACHLORIDE (BHC)

The figures below are for residues of total BHC. However, in adding amounts of individual isomers do not count alpha, gamma or delta BHC at a level below 0.1 ppm in milk or eggs and below 0.02 in other products. Do not count beta BHC at a level below 0.2 in milk or eggs and below 0.04 in other products.

Commodity	Action Level	Reference
Animal feed, processed	0.1 ppm	AG 7426.04-B
Barley, grain (animal feed)	0.1 ppm	AG 7426.04-B
Barley, grain (human food)	0.1 ppm	AG 7420.08-B
Beans	0.5 ppm	AG 7420.08-B
Citrus fruit[2]	0.5 ppm	AG 7420.08-B
Cocoa beans, whole raw bean	0.5 ppm	AG 7420.08-B
Corn, fresh sweet	0.5 ppm	AG 7420.08-B
Corn, grain (animal feed)	0.1 ppm	AG 7426.04-B
Corn, grain (human food)	0.1 ppm	AG 7420.08-B
Eggs	0.5 ppm	AG 7420.08-B
Endive	0.5 ppm	AG 7420.08-B
Figs	0.5 ppm	AG 7420.08-B
Frog legs	0.5 ppm	AG 7420.08-B
Guavas	0.5 ppm	AG 7420.08-B
Hays (animal feed)	0.1 ppm	AG 7426.04-B
Mangoes	0.5 ppm	AG 7420.08-B
Milk and dairy products	0.3 ppm (fat basis)	AG 7420.08-B
Milo, sorghums (animal feed)	0.1 ppm	AG 7426.04-B
Milo, sorghums (human food)	0.1 ppm	AG 7420.08-B
Oats, grain (animal feed)	0.1 ppm	AG 7426.04-B
Oats, grain (human food)	0.1 ppm	AG 7420.08-B
Peas	0.5 ppm	AG 7420.08-B
Pineapples	0.5 ppm	AG 7420.08-B
Quinces	0.5 ppm	AG 7420.08-B
Root vegetables[2]	0.5 ppm	AG 7420.08-B
Rice, grain	0.1 ppm	AG 7420.08 B
Rye, grain (animal feed)	0.1 ppm	AG 7426.04-B
Rye, grain (human food)	0.1 ppm	AG 7420.08-B
Small fruits[1,2]	0.5 ppm	AG 7420.08-B
Turnip greens	0.5 ppm	AG 7420.08-B
Wheat, grain (animal feed)	0.1 ppm	AG 7426.04-B
Wheat, grain (human food)	0.1 ppm	AG 7420.08-B

[1] Other than those commodities specified in 40 CFR 180.146.
[2] Refer to 40 CFR 180.34(f) for commodities covered by this food group.

FDA ACTION LEVELS

CADMIUM

Commodity	Action Level	Reference
Pottery (ceramics)		
Flatware (ave. of 6 units)	0.5 mcgs/ml of leaching solution	AG 7417.02
Small hollowware (any one of 6 units)	0.5 mcgs/ml of leaching solution	AG 7417.02
Large hollowware (any one of 6 units)	0.25 mcgs/ml of leaching solution	AG 7417.02

CHLORDANE

Commodity	Action Level	Reference
Animal fat, rendered	0.8 ppm	AG 7426.04-D
Animal feed, processed	0.1 ppm	AG 7426.04-D
Fish	0.3 ppm	AG 7420.08-L

CROTOLARIA SEEDS
(C. spectabilis and/or C. striata)

Commodity	Action Level	Reference
Grains and Feeds	Average of 1 whole seed/pound	AG 7426.03

FDA ACTION LEVELS

DIBROMOCHLOROPROPANE (DBCP)

Commodity	Action Level	Reference
Milk, raw, unpasteurized	1.5 ppm (fat basis)	AG 7420.08-D
Raw agricultural commodities (except milk)	0.05 ppm	AG 7420.08-D

DDT, DDE, AND TDE

The figures below are for residues of the above pesticides individually or in combination. However, in adding amounts of DDT, DDE and TDE do not count any of the three found below 0.2 ppm for fish, eggs, and grain.

Commodity	Action Level	Reference
Animal feed, processed	0.5 ppm	AG 7426.04-
Barley, grain (animal feed)	0.5 ppm	AG 7426.04-
Barley, grain (human food)	0.5 ppm	AG 7420.08-
Cocoa beans, whole raw bean	2.0 ppm	AG 7420.08-
Corn, grain (animal feed)	0.5 ppm	AG 7426.04-
Corn, grain (human food)	0.5 ppm	AG 7420.08-
Eggs	1.5 ppm	AG 7420.08-
Fish	5.0 ppm	AG 7420.08-
Hay	0.5 ppm	AG 7426.04-
Milo (sorghum), grain (animal feed)	0.5 ppm	AG 7426.04-
Milo (sorghum), grain (human food)	0.5 ppm	AG 7420.08-
Oats, grain (animal feed)	0.5 ppm	AG 7426.04-
Oats, grain (human food)	0.5 ppm	AG 7420.08-
Rice, grain (animal feed)	0.5 ppm	AG 7426.04-
Rice, grain (human food)	0.5 ppm	AG 7420.08-
Rye, grain (animal feed)	0.5 ppm	AG 7426.04-
Rye, grain (human food)	0.5 ppm	AG 7420.08-
Wheat, grain (animal feed)	0.5 ppm	AG 7426.04-
Wheat, grain (human food)	0.5 ppm	AG 7420.08-

FDA ACTION LEVELS

ENDRIN

Commodity	Action Level	Reference
Animal feed, processed	0.03 ppm	AG 7426.04-F
Asparagus	0.05 ppm	AG 7420.08-E
Beans	0.05 ppm	AG 7420.08-E
Citrus fruits[2]	0.05 ppm	AG 7420.08-E
Corn, fresh sweet	0.05 ppm	AG 7420.08-E
Eggs	0.03 ppm	AG 7420.08-E
Figs	0.05 ppm	AG 7420.08-E
Fish and shellfish	0.3 ppm	AG 7420.08-E
Fish meal, fish solubles, fish oil (animal feed)	0.3 ppm	AG 7426.04-F
Guavas	0.05 ppm	AG 7420.08-E
Leafy vegetables[1,2]	0.05 ppm	AG 7420.08-E
Mangoes	0.05 ppm	AG 7420.08-E
Melons	0.05 ppm	AG 7420.08-E
Milk and dairy products	0.3 ppm (fat basis)	AG 7420.08-E
Oilseed meal, peanut, soybean, cottonseed, etc. (animal feed)	0.03 ppm	AG 7426.04-F
Okra	0.05 ppm	AG 7420.08-E
Peas	0.05 ppm	AG 7420.08-E
Pimentoes	0.05 ppm	AG 7420.08-E
Pineapples	0.05 ppm	AG 7420.08-E
Pome fruits[2]	0.05 ppm	AG 7420.08-E
Pumpkins	0.05 ppm	AG 7420.08-E
Root vegetables[1,2]	0.05 ppm	AG 7420.08-E
Small fruits[2]	0.05 ppm	AG 7420.08-E
Stone fruits[2]	0.05 ppm	AG 7420.08-E
Vegetable oils and fats, including soapstock (animal feed)	0.3 ppm	AG 7426.04-F

[1] Other than those commodities specified in 40 CFR 180.131.

[2] Refer to 40 CFR 180.34(f) for commodities covered by this food group.

HEPTACHLOR AND HEPTACHLOR EPOXIDE

The figures below are for residues of the above pesticides individually or in combination. However, do not count heptachlor or heptachlor epoxide found at a level below 0.3 ppm for fish and 0.03 ppm for other products.

Commodity	Action Level	Reference
Animal feed, processed	0.03 ppm	AG 7426.04-G
Artichokes	0.05 ppm	AG 7420.08-G
Asparagus	0.05 ppm	AG 7420.08-G
Beans, except snap beans[2]	0.05 ppm	AG 7420.08-G
Citrus fruits[2]	0.05 ppm	AG 7420.08-G
Cucumbers	0.05 ppm	AG 7420.08-G
Dairy products (manufactured) except low fat dairy products[1]	0.3 ppm	AG 7420.08-G
Eggs	0.03 ppm	AG 7420.08-G
Eggplant	0.05 ppm	AG 7420.08-G
Figs	0.05 ppm	AG 7420.08-G
Fish and shellfish	0.3 ppm	AG 7420.08-G
Leafy vegetables[1]	0.05 ppm	AG 7426.04-G
Hays	0.03 ppm	AG 7420.08-G
Melons	0.05 ppm	AG 7420.08-G
Okra	0.05 ppm	AG 7420.08-G
Pears	0.05 ppm	AG 7420.08-G
Pimentoes	0.05 ppm	AG 7420.08-G
Pumpkins	0.05 ppm	AG 7420.08-G
Quinces	0.05 ppm	AG 7420.08-G
Rice, grain, (animal feed)	0.03 ppm	AG 7426.04-G
Rice, grain (human food)	0.03 ppm	AG 7420.08-G
Small fruits[1,2]	0.05 ppm	AG 7420.08-G
Stone fruits[1,2]	0.05 ppm	AG 7420.08-G
Squash (summer or winter)	0.05 ppm	AG 7420.08-G

[1] Other than those commodities specified in 40 CFR 180.104 and 180.319.

[2] Refer to 40 CFR 180.34(f) for commodities covered by this food group.

FDA ACTION LEVELS

KELTHANE
[1,1 Bis (p-chlorophenyl)-2,2,2,-trichloroethanol]

Commodity	Action Level	Reference
Animal feed, processed	0.5 ppm	AG 7426.04-H

KEPONE
[Decachlorooctahydro-1,3,4-methano-2H-cyclobuta (cd) pentalen-2-one]

Commodity	Action Level	Reference
Crabmeat	0.4 ppm	AG 7420.08-H
Fish	0.3 ppm	AG 7420.08-H
Shellfish	0.3 ppm	AG 7420.08-H

FDA ACTION LEVELS

LEAD

Commodity	Action Level	Reference
Pottery (ceramics)		
Flatware (ave. of 6 units)	7.0 mcgs/ml of leaching solution	AG 7417.03
Small hollowware (any one of 6 units)	5.0 mcgs/ml of leaching solution	AG 7417.03
Large hollowware (any one of 6 units)	2.5 mcgs/ml of leaching solution	AG 7417.03
Silver-plated hollowware (ave. of 6 units)	7.0 mcgs/ml of leaching solution if product intended for use by adults	AG 7417.01
Silver-plated hollowware (one or more of 6 units)	0.5 mcgs/ml of leaching solution if product intended for use by infants and children	AG 7417.01

FDA ACTION LEVELS

LINDANE

Commodity	Action Level	Reference
Animal feed, processed	0.1 ppm	AG 7426.04-I
Artichokes	0.5 ppm	AG 7420.08-I
Barley (animal feed)	0.1 ppm	AG 7426.04-I
Barley (human food)	0.1 ppm	AG 7420.08-I
Beans	0.5 ppm	AG 7420.08-I
Citrus fruit[2]	0.5 ppm	AG 7420.08-I
Cocoa beans, whole raw bean	0.5 ppm	AG 7420.08-I
Corn, fresh sweet	0.5 ppm	AG 7420.08-I
Corn, grain (animal feed)	0.1 ppm	AG 7426.04-I
Corn, grain (human food)	0.1 ppm	AG 7420.08-I
Eggs	0.5 ppm	AG 7420.08-I
Endive	0.5 ppm	AG 7420.08-I
Figs	0.5 ppm	AG 7426.08-I
Hays	0.1 ppm	AG 7426.04-I
Milk and dairy products	0.3 ppm (fat basis)	AG 7420.08-I
Milo (sorghum), grain (animal feed)	0.1 ppm	AG 7426.04-I
Milo (sorghum), grain, (human food)	0.1 ppm	AG 7420.08-I
Oats, graim (animal feed)	0.1 ppm	AG 7426.04-I
Oats, grain (human food)	0.1 ppm	AG 7420.08-I
Peas	0.5 ppm	AG 7420.08-I
Rice, grain (animal feed)	0.1 ppm	AG 7426.04-I
Rice, grain (human food)	0.1 ppm	AG 7426.08-I
Root vegetables[1,2]	0.5 ppm	AG 7420.08-I
Rye, grain (animal feed)	0.1 ppm	AG 7426.04-I
Rye, grain (human food)	0.1 ppm	AG 7420.08-I
Small fruits[1,2]	0.5 ppm	AG 7420.08-I
Turnip greens	0.5 ppm	AG 7420.08-I
Wheat, grain (animal feed)	0.1 ppm	AG 7426.04-I
Wheat, grain (human food)	0.1 ppm	AG 7420.08-I

[1] Other than those commodities specified in 40 CFR 180.133.

[2] Refer to 40 CFR 180.34(f) for commodities covered by this food group.

FDA ACTION LEVELS

MERCURY

Commodity	Action Level	Reference
Fish, shellfish, crustaceans, other aquatic animals. Edible portion only. Fresh, frozen or processed.	1.0 ppm	AG 7408.09
Wheat (pink kernals only)	1.0 ppm	AG 7404.04

METHYL ALCOHOL

Commodity	Action Level	Reference
Imported brandy	0.35%	AG 7401.01

MIREX

Commodity	Action Level	Reference
Fish	0.1 ppm	AG 7420.08-J

NITROSODIMETHYLAMINE (NDMA)

Commodity	Action Level	Reference
Malt Beverages	5 ppb 3 ppb or less	CPG 7101.06

FDA ACTION LEVELS

PARALYTIC SHELLFISH TOXIN

Commodity	Action Level	Reference
Clams (fresh, frozen, canned)	80 ug/100 g meat	AG 7408.04
Mussels (fresh, frozen, canned)	80 ug/100 g meat	AG 7408.04
Oysters (fresh, frozen, canned)	80 ug/100 g meat	AG 7408.04

POLYBROMINATED BIPHENYLS (PBB's)

Commodity	Action Level	Reference
Milk & dairy products (fat basis)	0.3 ppm	"A Review of Congress William. H. Brodhead's Petition to Reduce FD Action Levels for Polybrominated Bipheny (PBB) In Food", July
Meat (fat basis)	0.3 ppm	
Eggs	0.05 ppm	
Animal Feed	0.05 ppm	

FDA ACTION LEVELS

POLYCHLORINATED BIPHENYLS (PCB's)

Commodity	Action Level	Reference
Paper food-packaging material intended for or used with human food, finished animal feed & and components intended for animal feeds	10 ppm 5 ppm fish edible portion	21 CFR 109.30(a)(9) and 509.30(a)(9) Tolerance stayed on 8-24-73 (38 FR 22794) 21 CFR 109.6(d) and 509.6(d)
Red Meat	3 ppm (fat basis)	CPG 7111.02

TOXAPHENE

Commodity	Action Level	Reference
Animal feed, processed	0.5 ppm	AG 7426.04-H
Artichokes	1.0 ppm	AG 7420.08-K
Asparagus	1.0 ppm	AG 7420.08-K
Cherries	1.0 ppm	AG 7420.08-K
Figs	1.0 ppm	AG 7420.08-K
Fish	5.0 ppm	AG 7420.03-K
Melons	1.0 ppm	AG 7420.08-K
Mustard greens	1.0 ppm	AG 7420.08-K
Plums	1.0 ppm	AG 7420.08-K
Pumpkins	1.0 ppm	AG 7420.08-K
Root vegetables[1,2]	1.0 ppm	AG 7420.08-K
Small fruits[1,2]	1.0 ppm	AG 7420.08-K
Squash (summer or winter)	1.0 ppm	AG-7420.08-K
Turnip greens	1.0 ppm	AG 7420.08-K

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[1] Other than those commodities specified in 40 CFR 180.138.

[2] Refer to 40 CFR 180.34(f) for commodities covered by this food group.

Testimony of John B. Lampe

Superintendent of Water Quality

Municipality of Metropolitan Seattle

My name is John Lampe. I am Superintendent of Water Quality for the Municipality of Metropolitan Seattle, more commonly referred to as Seattle Metro.

As you have heard from previous testimony the subject of toxicants is extremely complex.

One need only review the headlines and newspaper articles describing recent scientific findings and listen to the public reaction they have generated to realize there is substantial concern over this issue. One also need only review the letters to the editor by these same scientists disclaiming, redirecting or correcting misplaced emphasis of these same headlines and articles to realize the confusing and complex nature of the problem.

For example, previous testimony notes that the water column in Puget Sound is relatively clean and the sediments in the central basin--surrounded as it is by an industrialized, urbanized environment of more than two million people--is remarkably healthy. There are, however, several red flags. There are well documented buildups of toxicants in the mud at the bottom of Elliott Bay, Commencement Bay, Port Gardener and the near-shore areas contiguous to those embayments. Biological abnormalities have been noted. The commercial fishery and the migratory fish populations, however have not been affected.

We are also reminded that as a society we have made great strides in recent years to protect our waters and environs. We are removing the lead from gasoline, have banned certain compounds such as DDT and have restricted the use of others such as PCB's. We are employing new and improved methods of controlling pollutant wash-off from paved surfaces with storm water retention basins and "good-housekeeping" guidelines for industry have been implemented. We have spent billions of dollars on water pollution control.

So what conclusions does a citizen draw from all this. I think we are confusing to the citizens. They are interested in common sense answers to fundamental questions: Are things getting better or worse? What are the public health implications of the data we now have? Without answers to these questions it will be difficult at best to maintain the public interest and commitment to solutions.

Metro is nationally and, indeed, internationally recognized as a success story that is a testimony to the citizens of this region. What made it all work was a clearly articulated problem, a clearly defined solution, and a clearly identified method of implementation with built in public accountability. Problem. Solution. Implementation. Accountability. Hardly a complex formula, but one that has proven to be extremely effective.

It is this successful formula that directed Metro three years ago in its approach to the new era of water quality problems--toxicants. While NOAA has focused on important basic research, and EPA and DOE have been monitoring the overall health of Puget Sound, Metro is exploring possible solutions. We need to be certain we have the correct balance among these three approaches. I would suggest that we are now at a point where we should seriously consider emphasizing a "solutions oriented" research design for the future.

Without more specific direction, continuing to look for problems can be an endless task resulting only in more complexity and confusion. If, on the other hand, a set of specific solutions are proposed then the research becomes more directed, productive, understandable and the potential for action more real.

It was in this vein that the Metro Council authorized a multi-million dollar study of toxicants with an emphasis on solution alternatives and what Metro as a water quality protector needs to do to implement those solutions. This substantial commitment of local ratepayer dollars was necessary to determine the best courses of action and the most practical use of taxpayer dollars. Our research efforts are designed to insure a clear and understandable problem statement and defined solutions which are implementable and accountable to the people who will pay the cost and really care about the outcome. Possible solutions to the toxicant issue addressed in the study include: a specialized treatment plant for industrial discharge, more extensive industrial pre-treatment, increased levels of sewage treatment at all our plants, combined sewer overflow controls, air pollution controls, and restricting the sale of some toxicants.

Metro is pursuing these and other specific solutions. Alternatives will be identified in approximately nine months when the study is complete.

To be certain, the alternatives we develop will be more than can be done with available dollars and judgments will have to be made as to which if any warrant allocation of the scarce dollars available for water quality protection. This will not be a surprising result and will be a problem eventually faced by every urban area in the nation.

However, unlike every other area of the nation, Puget Sound presents a unique opportunity. As NOAA has pointed out, we have a more substantial data base, and more extensive research on toxicants than any other area of the nation. As DOE noted, we have already made great strides in Puget Sound to protect it from the same fate as other bodies of water around the country. We have in the Northwest the scientific expertise which is unparalleled in the country. And, most important we have the spirit, the dedication and the determination of an enlightened citizenry. In short we have a unique combination of data, expertise, determination and demonstrated commitment. The people of Puget Sound will not stand for degradation of area waters and have time and again pledged monetary resources to protecting them. Our unique opportunity is to make Puget Sound a model for the nation in dealing with toxicants.

It is both an opportunity and a challenge. The Federal challenge is to insure the dollars necessary to continue to do the research and implement the solutions in a way that rewards those communities that exhibit intergovernmental coordination in this regard. At the present time, agencies must thread their way among a myriad of federal funding programs which provide neither the incentive nor the reward for such coordination. We are not an urban area that has just discovered it has a problem and wringing its hands waits for Federal handouts and/or mandates. We are in the process of responding, and we would like recognition of that fact and support in our efforts.

The local challenge is to join together in a coordinated and jointly funded effort to protect the Puget Sound waters. In addition to the $531 million Seattle Metro has already committed to major capital improvements for which clear problems have been defined, the Metro Council has also invested 4 million local dollars to study the problem of toxicants. I am sure the Metropolitan community is prepared to invest more. However, the problem reaches far beyond Metro's jurisdiction, and we are certain the citizens of the numerous other jurisdictions within the Puget Sound community hold the same determination and are prepared to make the same financial commitments to meet the challenge of toxicants in Puget Sound. And we need to get on with the business of coordinating this.

Unlike other areas of the nation, Puget Sound is not yet in its eleventh hour. We are way ahead in research and have the time to implement the solutions necessary to protect this priceless natural resource. With a coordinated approach to research, and a partnership of federal and local dollars we can insure the future of Puget Sound.

Comments by Alyn C. Duxbury at the United States Senate Field Hearings on Toxic Chemical Pollution in Puget Sound

October 25, 1982

Seattle, Washington

The scientific effort presently underway to identify sources, pathways, sinks and the effects of pollutants in Puget Sound is indeed a noble effort and to be commended. The research is of high caliber, at the state of the art, and blessed by an unusual degree of cooperation between the participating agencies, municipal, State and Federal.

I see no obstacles to keep the ongoing effort from eventually leading to an excellent understanding of the fate and effects of pollutants in the Puget Sound System. Further, as knowledge increases, I believe a rational understanding of the significance of our pollution problem and even what constitutes a pollutant will develop and that it can be put into a proper perspective that can be transfered to and understood by our concerned population and used by those agencies responsible for managing Puget Sound as a resource.

The route to this ultimate goal is not a particularly smooth one. The piece wise accumulation of knowledge and facts leads to several dilemmas that are inherent in the process. I will numerate only a few of these.

What is learned often leads to more unanswered questions than answers. This of course can lead to a requirement of expanding the research so greatly, that its completion could never be achieved. This must be avoided and the research must lead to conclusions even if it is not quite sufficient. The need to release new information before sufficient has been gathered to fully answer a question often leads to a misinterpretation of the significance of the new information. However, the alternative of keeping the data secret would also be bad. The release of data as obtained creates the risk that this new but incomplete data may be distorted, sometimes unknowingly, to fit a pre-conceived theory rather than the theory being adjusted to fit the complete body of facts; the process of jumping to conclusions.

There is also the fact that the emphasis of the ongoing research, when coupled to the increasing intensity of effort, makes it appear that the problems that beset Puget Sound are increasing. Many do not stop to think that problems grow in direct proportion to the search for them.

I cannot help but feel our view of the present state of Puget Sound would be quite different if there was an equal effort that searched for the good things found in Puget Sound that indicated how well the Sound is able to handle human impact.

Many of us living along the Puget Sound want to see the Sound unchanged from an undefined pristine state. Changes that are observed or any activities at present or planned for the future that will produce changes are labeled as bad and to be fought tooth and nail. This attitude however is not always kept in perspective. We are sometimes not willing to accept the fact that certain uses of the Sound are a necessity if a population is to remain on the shores of this body of water. Water related commerce and industries support our existence and services that result in the discharge of wastes are a must. These water related uses exhert a tax on nature and at times they exclude other uses in their vicinity. Their impact should be accepted by those of us benefiting from their presence. The ongoing research is documenting those impacts that are both necessary and in excess and therefore unnecessary. However, there is little real effort to separate these. Instead, they are often presented together as being part of the problems of Puget Sound. Little effort is made to balance part of these observed impacts against the benefits arising from using the Sound. Our concern should be focused on those observed problems that arise from our excesses and not those from the required uses.

The scope of the research presently being conducted will allow us to eventually determine the relative importance of anthropogenic effects versus natural effects and necessary versus unnecessary effects. It will allow us to make determinations of where and how to invest our efforts in corrective measures to solve the real problems created by past and present practices and how to plan for the future. It is hoped that we can wait until sufficient is known to do this wisely and not be tempted to react too early, generating unneeded solutions for non-real problems. The desire to protect our limited natural resources must be tempered with the understanding that there is also a limit to the resources available for instituting corrective measures. We cannot afford to be too hasty and be paniced into programs that are wasteful and ineffective and produce a false sense of security.

Eventually the story will emerge from the ongoing research program. We will learn which of those substances classed as pollutants are not pollutants to the Sound even though present. Knowledge of chemical states, rates of delivery and removal, pathways of travel between sources and sinks, and significance to the biota will help us determine which compounds and substances must receive attention and which can be ignored. We will further learn where and how to make corrections that are significant and effective and that will protect the Sound but will still allow our existence.

The present programs delineating the status quo have a tremendous task, as they must identify what we have done in the past, separate this from the present practices, and guide us how to alter future practices effectively and efficiently. As we move forward to make corrections, it will be an easier task to determine if progress is achieved, for we will be looking for changes in only those areas and those parameters which have been identified as significant.

We are lucky, for Puget Sound as a system is still a reasonably healthy environment. Indeed, there are degraded areas, primarily sediments, that need attention and some of the small embayments are susceptible if overtaxed by too much addition of wastes. In general, past practices of some industries, or accidents, have created our worst problems while present practices are well on their way to being effectively controlled. In fact, improvements in water quality that are observable today are related to present controls. Puget Sound's improvement under present controls and its ability to withstand changes and compensate gives us time; time to learn what to do. I hope all concerned in the well-being of the Sound will remain patient and supportive of the ongoing research which is seeking the required goal of understanding and not pre-judge the situation before all the evidence is available.

Testimony delivered to the Joint Hearing of the U.S. Senate Committees on Commerce, Science and Transportation and Environment, and Public Works:

TOXIC CHEMICAL POLLUTION IN PORTIONS OF PUGET SOUND

Senator Gorton and Committee members:

I wish to begin by thanking you for conducting this hearing. I sincerely hope that the public comments you recieve today will be well considered as you carry on your representative duties in the Senate.

The title selected for todays hearing is, I think, an interesting one. "Toxic Chemical Pollution in Portions of Puget Sound". It sounds as if we are going to be very careful to limit our discussion to a restricted area of the Sound and only certain types of threats. That might seem like a good idea considering the need for brevity in this type of proceeding, but unfortunately it distorts the true picture, and it is just such distortions which are responsibile for many of the problems we face today. One need not be a scientist to realize that water tends to distribute pollutants and that fish move. While we may like to believe it is possible to confine pollution to "portions" of a body of water, that belief is unrealistic. If we are ever going to make real progress in this endeavor we must realize that pollution of anywhere is pollution of the planet as a whole. That may sound to you like an environmental shiboleth, but I earnestly believe it is the truth and our survival may depend on its recognition as such.

Having expressed my concern with the matter of titles as they reflect thoughts, let me move to the specific case of the Puget Sound. I suggest that in your consideration of environmental destruction you try to always bear in mind that what you are considering is often not a primary problem but rather a symptom. The Puget Sound pollution which we are considering is an instructive example of this.

The symptoms in this case include bottom fish with tumors and markedly elevated levels of toxics, significantly elevated rates of a variety of illness and causes of death among residents of Pierce County, which is where I live, bottom sediments which have become so heavily contaminated be various metals that they might one day be considered as minable ore, and a host of other findings from studies which I hope you are aware of.

If those are the symptoms what might we identify as the causes in this case? There are,of course, many causes which one might address, but it seems to me that several are particularly relevant today. Without wishing to sound so radical that the committee will discard my words, I think one must seriously consider that one of the chief causes of pollution is an economic system which has placed profits as the bottom line and which has actually rewarded the companies for their pollution. Simply put, companies have polluted because it was less costly to dispose of their waste products in the public domain than it would have been to responsibly dispose of it in private and adequately protected ways. (As an aside I hope the committee is aware that there are serious questions about our ability to store these toxics for prolonged periods without leakage.) I have identified companies as polluting for economic reasons and in fairness I must also state that the same motives are largely operative on an individual level as well. The private citizen who illegally dumps garbage, or who pours used oil down the sewer is operating from much the same motive, just on a smaller scale.

A second cause of todays problems is public ignorance and indifference. The public has kept itself uninformed about pollution, and polluting industries have distributed abundant disinformation through media campaigns and marketing. We want to believe all chemicals are safe and the industry wants us to believe it too. We also do not want to take the effort to protect land or water resources which everyone owns but we do not personally profit directly from. This makes pollution and destruction of the commons more likely.

Government officials have been a third part of the pollution problem for a combination of the reasons mentioned above. Specifically, and with apologies to the exceptions who may or may not be present, elected officials have been rewarded for weakening pollution regulations and have been frequently disinformed. The contributions of corporate PACs to anti-environment candidates attests to the former proposition while efforts of highly paid lobbyists offer evidence for the second.

It is possible to continue in this vein, but time restraints require that I move to other matters. The matters which I find most pressing for today concern what lessons we might learn from past pollution of the Puget Sound and how the present administration has responded.

One of the primary lessons is that corporate responsibility is based on profits not the environment. Where was corporate responsibility when hundreds of thousands of tons of waste were being dumped in Commencement Bay? Which corporations fought the hardest to prevent Superfund legislation that would establish financial liability? Corporate responsibility to the environment clearly cannot be trusted, but the Reagan administration is pushing for exactly that, and the enforcement staffs of EPA and OSHA have been markedly reduced.

A second lesson is that what benefits industry may not benefit the public or the environment. Industry lobbyists are making a well financed case for the consideration of cost benefit analysis in environmental regulations. This might be an appealing idea in these economic hard times, but history has shown us that what is really being talked about is private benefits at the expense of socialized costs. It amazes me that the conservative senators and congressmen who rail against budget deficits are so content to pass down massive environmental debts to future generations.

A third lesson is that what we don't know can hurt us. Reagan, Gorsuch, and the pollution lobby have recieved support from a recent court decision requiring that regulations be based on scientific evidence of danger to health or the environment. Senator Gorton has expressed this perspective along with the cost benefit concern mentioned above. Unfortunately, many of those who demand that regulations be supported by scientific evidence seek to prevent that very support by reducing research budgets of EPA, NOAA, OSHA and other agencies. We should not forget that many of the pollutants now known to be extremely dangerous were once thought to be harmless and that the cost of ignorance can be well above even liberal estimates. Just ask the aesbestos companies. Beyond the budget cuts for research there are more ominous assaults on research taking place under the Reagan banner. Evidence supporting regulations has been removed from reports without the consent of researchers, individuals whose findings upset industry have been given termination notices, the director of the presidents cancer advisory is Armand Hammer whose company owns the ecologically disasterous Hooker Chemical, and a Reagan appointee has even gone as far as recommending political loyalty tests for researchers.

A fourth, and for this testimony final lesson, relates to what I said at the outset about global pollution. Specifically the lesson is that one cannot be content to ignore pollution that is down the street or in public rather than private property. The Puget Sound has been polluted, like the rest of the Earth, because too many citizens and government officials had a self centered tunnel vision perspective. I hope the commitee heard the director of the U.N. environmental group when he said that by the year 2000 we face ecological destruction as complete and irreversible as that which would result from nuclear war if we continue our present policies. President Reagan is evidently unconcerned because his administration has reduced the U.S. contribution to global protection by 20% and has made it easier for U.S. companies to export products which are known to damage human and environmental health.

So where are we today? We are living, indeed we are meeting today, near one of the worlds beautiful waterways and discussing the fact that it has been polluted to such an extent that certain organisms no longer exist in portions which they once inhabited, and those which still reside there are so poisoned that they cannot be safely eaten by humans. The President of this nation is apparently not concerned by this and is actively playing a major part in making new and continued pollution likely both here and worldwide. The citizens are so worried about the economy that they care little for the environment, and those future generations who will suffer from our disregard are not yet here to chastise us for our irresponsibility. The political system is being heavily influenced by campaign financing and lobbying from individuals and corporations that actually profit from pollutions. Over twenty thousand known toxic chemicals are being used today,and hundreds more are being introduced each year. Study after study has told us that we are losing species, drinking water, topsoil, rainforest, energy reserves etc. at an unprecedented and unquestionably not sustainable rate. We are on an isolated small planet moving alone through the coldness of space and the people in charge are damn fools.

Senator Gorton, you have taken some progressive steps to educate the public about the problems which social security is facing and to solicit their opinions about what should be done to remedy them. I applaud your initiative and courage in those efforts. I submit that the perils faced by the environment of the Puget Sound and our planet are ultimately far more significant than even that very important matter of social security. If the oceans die, our cost of living increase problems will not be very important.

I ask you to take a lead in stepping out of the economic frustration which is gripping the nation to look at the longer term issues of the environment. We must not allow the Reagan administration or any other to syrup-titiously poison and errode our life support while telling witty stories and lowering taxes to buy votes.

The Puget Sound is not yet dead, but its injuries will not have been in vain if they help awaken you and other leaders to the real dangers we face.

Thank you

Brian Baird
2901 North Warner
Tacoma WA 98407

FAUNTLEROY
ENVIRONMENTAL
ASSOCIATION
8916 Fauntleroy Way S.W. Seattle, Washington 98136

October 25, 1982

The Honorable Slade Gorton
2988 Federal Building
915 Second Avenue
Seattle, WA 98174

Dear Senator Gorton:

We regret that there will not be time for our organization, the Fauntleroy Environmental Association, to testify at your special hearing on water pollution in Puget Sound. As you have requested, we have prepared a report on the pollution in Fauntleroy Cove.

Our organization was formed three and a half years ago to combat or mitigate the negative impacts of the Fauntleroy/Vashon/Southworth ferry service on our residential neighborhood. While problems of traffic and parking congestion, theft and vandalism, air, noise and visual pollution are created by the ferry, the polluted water, the dying sealife and the broken or changing ecosystem in Fauntleroy Cove has another matrix which may include the ferry system, Metro, storm sewers and streams, or other sources of pollution in Puget Sound.

Our cove appears to be a microcosm of what Puget Sound could become if we allow it. For this reason we urge you to consider the pollution of Fauntleroy Cove most seriously.

Sincerely,

Jeanne Hansen
Jeanne Hansen
Co-Chair, FEA

Chickie Buckner
Chickie Buckner
Co-Chair, FEA

Sigrid Karlstrom
Sigrid Karlstrom
Treasurer, FEA

/sk

REPORT OF AIR AND WATER POLLUTION IN FAUNTLEROY COVE
Submitted by
FAUNTLEROY ENVIRONMENTAL ASSOCIATION

As residents of a community built around Fauntleroy Cove on Puget Sound, we are alarmed. Our beautiful cove is polluted, the air is foul, our property values have decreased and the quality of life has been diminished. There is also a good possibility that the environment of our neighborhood is unhealthy.

For the last three summers, 1980, '81, '82, we have experienced eight to ten week-long episodes of intolerably foul air, each one more intense than the previous one and of longer duration. The water has consistently registered a high fecal coliform count,* the water often takes on a brownish, foamy look, and the sand in some parts of the beach carries identifiable decomposing matter.

The odor can be detected over a wide area, depending on the wind, and is usually restrained by the hills and trees that surround the community. The hydrogen sulfide and methane gases settle into hollows or fenced yards and permeate homes through closed windows. Often fog or a warm air "lid" will hold the smell in place. There is no escaping this stench if one is in its path.

The build-up begins at the end of June, peaks mid-July to mid-September and often continues into October. This period seems to coincide with the warming of Sound waters and the onset of another possible "sewage/decomposed vegetation" pollution, the "Red Tide."

The first foul air episode occurred in 1959 and was undoubtedly due to spillage connected with the new trunk sewer or lift station Metro had installed that summer. The bad odor contaminated a three-block area near the station for several months and was not dispelled until the sewage-tainted seaweed was buried.

Metro admitted that there had been an overflow in the summer of 1980, an explanation accepted by the newly formed community group (FEA). However, in 1981 the smell recurred, and again in 1982, at exactly the same time and with only slight variations in the "smell" pattern.

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* Dr. Fillmore Buckner took a water sample from the cove in August, 1981 which registered 90,000 ppml. Other samples taken by Metro and EPA have not been as high but are still considered dangerous.

FAUNTLEROY POLLUTION REPORT

Another geographical feature, a clay bottom on the cove, is probably responsible for collecting anaerobic decomposing matter and keeping it from being absorbed into the cove bed. Since this anaerobic matter can remain dormant in salt water indefinitely, the supply on the bottom of Fauntleroy Cove could continue to contaminate for many years.**

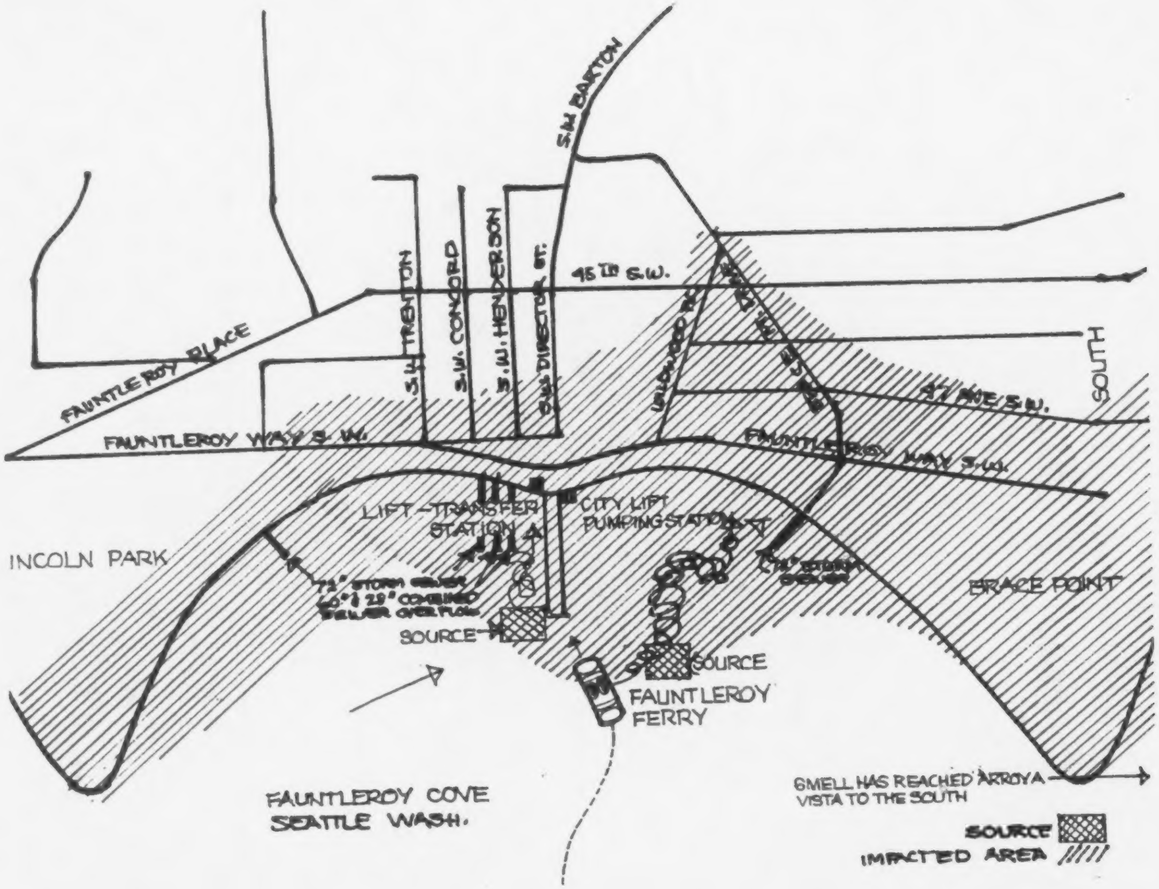
The material that is now being brought to the surface could be from (a) sewage that was deposited from Fauntleroy residences before the Metro installation, (b) the large sewage spill of 1959, (c) sewage systems both north and south of the cove could be polluting (There is a possibility that outflow from West Point, which is only primary treated sewage, is carried south to Fauntleroy Cove. The brown sewage streak is visible from Magnolia Bluff.), (d) the three large storm sewers could carry elements that kill seagrass and other life in the cove that then decompose and contribute to the collection of anaerobic matter, (e) nutrients from the storm sewers, (f) nutrients from the creek that flows into the cove, (g) overflows from the City or Metro lift stations, (h) ferry and dock waiting room sewage.

A third factor that could help create the foul smell is the activity of the new Issaquah-class ferry. The Issaquah, with its variable pitch propellor, started on the Fauntleroy run in the summer of 1980 - the first foul-smell summer since the huge Metro spill of 1959. The following two summers reinforced the pattern; the smell usually begins near the dock, with another source area 500 feet south of the dock. (See map.) In all cases the Issaquah or a sister ship (two of the three ferries on the run) pass through or are docked when new gas occurs in the cove. The FEA speculates that these new, powerful propellors bring the anaerobic decomposed matter to the surface where it combines with the air and creates the putrid gas.

In the early 1930's Fauntleroy Cove still maintained an exemplary ecosystem despite the build-up of houses, the addition of Lincoln Park and the ferry terminal. Shrimp, crab, geoducks, clams, salmon, rock fish, sole and flounder, skate and octopi, all found their home in our cove. But soon the pollution became too much - seaweed, anemones, the shrimp and some fish disappeared until the new Metro sewer line went in. Within 10-15 years many of the species came back and our cove was once again a thriving ecosystem. Unfortunately, it did not last, for the pollution increased and the cove returned to a home for ratfish and dogfish again. And now we have the putrid odor - a warning of the contamination below.

**Dr. Peter Breysse, Dept. Head, Environmental Health, University of Washington.

October, 1982


FAUNTLEROY PLACE
FAUNTLEROY WAY S.W.
S.W. TRENTON
S.W. CONCORD
S.W. HENDERSON
S.W. DIRECTOR ST.
S.W. BARTON
45TH S.W.
WILDWOOD PL
47 AVE S.W.
FAUNTLEROY WAY S.W.
SOUTH
LIFT-TRANSFER STATION
CITY LIFT PUMPING STATION
72" STORM SEWER
60" & 29" COMBINED SEWER OVERFLOW
24" STORM SEWER
INCOLN PARK
SOURCE
SOURCE
FAUNTLEROY FERRY
BRACE POINT
FAUNTLEROY COVE
SEATTLE WASH.
SMELL HAS REACHED ARROYA VISTA TO THE SOUTH
SOURCE ▨
IMPACTED AREA ////

Seattle
Audubon
Society

619 Joshua Green Building • Seattle, WA 98101 • 206/622-6695

STATEMENT TO THE SENATE COMMERCE COMMITTEE
AND THE SENATE ENVIRONMENT AND PUBLIC WORKS COMMITTEE

TOXIC CHEMICAL POLLUTION OF PUGET SOUND

Recent studies by the National Oceanographic and Atmospheric Administration (NOAA) have shown parts of Puget Sound to be heavily contaminated with toxic chemicals, some of them known to be cancer-causing. The details of these studies, and their findings, are well known to the Committees and need not be discussed here.

The significance of these findings for humans, fish and other marine life, and wildlife is not yet known. However, the following points are illustrative of a potentially major ecological problem:

- The problem is a serious one. While we can appreciate the many steps that have been taken to reduce the influx of toxicants to Puget Sound, the problem is far from controlled. Significant quantities of more than 1,000 organic compounds and heavy metals have been found in sediments around the Sound. Evidence of significant accumulation of some of the substances in the bottomfish raises serious health questions -- especially for persons who depend on catching fish and other marine life for subsistence. Even though levels of toxicants detected in fish to date are below maximum contaminant levels allowed by the Food and Drug Administration, the bioaccumulation is sobering. As illustration, a study conducted in 1977-78 found high concentrations of the chlorinated hydrocarbons PCB and DDE in the blubber of harbor seals in Puget Sound. The average level of concentration for PCB, for example, was 171 ppm in southern Puget Sound, 31 ppm in Hood Canal, and 14.8 ppm for Northern Puget Sound (in the San Juan Islands area). Fish eaten by the seals showed much lower concentrations of these hydrocarbons (wet weight: 200 to 10,000 times lower; lipid weight: 20 to 200 times lower), indicating that "harbor seals absorb a majority of the PCB and DDE in their diet and retain a high percentage of it during their life span." (Calambokidis, et al, 1978, p. 10). The authors note the significantly higher concentrations of PCB and DDE in Southern Puget Sound were where they also found highest seal pup mortality -- although they were unable with available data to establish a link between mortality and contaminants.

- The problem is not simply one of yesterday's bad practices. It has often been said that the problems in Puget Sound are primarily the result of past waste management practices. In effect, the role of on-going discharges is dismissed. We disagree with this assessment. While acknowledging that poor past practices have played a major role in polluting the Sound, we contend there are significant on-going sources of contamination that must be addressed. For example METRO releases toxic-contaminated effluent at the rate of 100 million gallons per day. Another source of continued pollution exists in Seattle's combined sewage system. Most Seattle sewers handle effluent and run-off -- when heavy rains occur, pipes in the system often are unable to handle all the material pouring into them. The result is a discharge of raw sewage - including untreated toxic chemicals. In addition, there are hundreds of industrial sources which discharge into the Sound under NPDES permits. One facility to which we wish to call special attention is the Bremerton shipyards in Sinclair Inlet. To our knowledge, no sampling of sediments or fish has been conducted in this area. Yet it may be one of the worst in Puget Sound. We believe the Navy, just as the private sector, ought to comply with sound environmental practices. Finally, on-going pollution by some metals may occur from "non-point" sources -- from run-off in urban areas which eventually seeps into the Sound.

Steps can, and must, be taken to ensure that industries are in full compliance with their discharge permits. Strong enforcement today is essential.

- Better coordination is needed in efforts to address the problem in Puget Sound. The Environmental Protection Agency, METRO, The National Oceanographic and Atmospheric Administration, The Department of Ecology, and others, have contributed a substantial amount to our knowledge of problems in the Sound. Certainly these agencies have attempted to work cooperatively with one another. There is, however, a sore lack of coordination at the highest levels within these agencies, and much time, effort and money are wasted as each goes about pursuing its particular projects. Coordination among all involved agencies can be achieved through designation of one agency to serve as the lead in such a coordinating effort. There is no need to create a new bureaucracy; rather, it makes sense to strengthen the existing structure.

With these points in mind, the Seattle Audubon Society strongly endorses continued Federal funding, and makes the following recommendations for use of those funds:

1. There should be continued sampling of sediments and marine life for evidence of chemical pollutants in Puget Sound. In addition to additional sampling in areas already studied, Bremerton, Bellingham and Shelton are other locations to be included.

2. The sources of pollutants should be identified and efforts made to curtail their discharge into the Sound. METRO had begun work on this problem. Much more remains to be done.

3. The risk to human health should be considered. It is important to provide some estimate of exposure to toxic chemicals by identifying persons who fish in the contaminated areas, and by obtaining information about the types and quantities of marine life consumed.

4. Finally, we recommend the establishment of a coordinating committee to see that activities such as those just mentioned are conducted efficiently and effectively. We suggest representation on the committee include: The Environmental Protection Agency; NOAA; the Puget Sound Air Pollution Control Agency; METRO; Washington State Department of Ecology; Washington State Department of Social and Health Services; representatives from involved county health departments; and informed private citizens.

In closing, we wish to stress the ecological threat posed by toxic chemical pollution of Puget Sound. Even if evidence of diseased and deformed fish did not exist, the fact that potentially harmful chemicals have been, and continue to be, discharged into the Sound indicates a lack of respect and concern for the total environment which is unacceptable. Given that such fish have been found in areas of high toxic chemical concentrations, and the knowledge that a potential risk to human health exists, continued discharge of these chemicals from any source, public or private, must not go on. The continuation of such activities shows a level of irresponsibility by those who pollute, and by those who allow the pollution, which cannot be condoned.

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In addition to the above references, the National Oceanographic and Atmospheric Administration has conducted several studies which have been published, and which were referred to in our statement.

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

School of Public Health and Community Medicine
Department of Environmental Health, SC-34

November 5, 1982

The Honorable Slade Gorton
United States Senator
2988 Federal Office Building
915 Second Avenue
Seattle, WA 98174

Dear Senator Gorton:

As a member of the Washington State Department of Fisheries Advisory Committee to Review Effects of Chemical Contaminants in Puget Sound, I was pleased to have an opportunity to attend the hearing which you chaired on that vital issue in Seattle on October 25, and wish to submit this letter in support of further efforts you have advocated to evaluate the toxicologic and public health aspects of this problem.

During the past two years or so, our committee, chaired by Dr. Donald Malins of the National Marine Fisheries Service of NOAA, has advocated establishment of an ongoing program in the local area to evaluate pollution-related changes in health and survival of marine life of Puget Sound and to determine how such changes might affect the consumer of contaminated fish and shellfish. We have advocated that specific activities be undertaken as part of this program including steps to (1) identify sources, types and concentrations of specific chemicals which are responsible for altering the health and disposition of Puget Sound marine life, (2) conduct laboratory research to evaluate the mechanisms by which those chemicals produce toxic effects in fish and other species, (3) identify human populations which may be at potential risk of toxicity through consumption of contaminated fish and estimate the extent of exposure from consumption patterns, (4) establish a program of regular surveillance of exposed populations, and (5) evaluate data from all combined research activities to formulate risk assessments and provide a basis for remedial actions.

We believe that implementation of these recommendations would provide a solid basis for identifying serious pollution-related problems of Puget Sound and for taking timely and effective action to protect both the fishery resources and consumers. We see the development of toxicity data regarding the chemicals of concern to be a particularly important aspect of this program, since failure to respond to the human health issue may result in strong resistance to the consumption of fish and shellfish and contribute to unwarrented or inappropriate concern about the safety of these important resources.

As a step toward implementation of the program we have advocated, I would like to draw your attention to the extensive capabilities and resources for chemical, toxicological and epidemiological assessment which are established within the Department of Environmental Health, and which could be readily brought to bear on this problem. Among the foremost of these resources are the Environmental Health and Trace Organic Analytic Laboratories, the former of which , as mentioned by Chairman Gil Omenn in his October 18 letter to you, is operated in conjunction with the State Department of Labor and Industries. These facilities provide for the most sophistocated approach currently available to identification, speciation and quantitation of toxic environmental chemicals. Departmental scientists who operate these resources are widely experienced in the evaluation of priority and non-conventional pollutants in Puget Sound as well as in other regional waterways. The department also offers the capabilities of an established environmental toxicology team which is dedicated to understanding the mechanisms of action of toxic environmental chemicals such as those found in Puget Sound. Scientists in this group have considerable laboratory research experience in evaluating the molecular mechanisms of chemical toxicity in a variety of marine and mammalian species and in assessing the risks of toxic chemical effects in human populations. The recent addition to the department's faculty of two outstanding new toxicologists with expertise in developmental and genetic toxicology respectively, provide us with extensive capabilities for evaluating many of the most important public health concerns associated with exposure to the chemicals of interest. Finally , the department's Health Effects Research Group offers expertise in pathological and ultrastructural assessment techniques which could be most useful to the proposed program in the evaluation of tissue and organ damage resulting chemical effects in exposed organisms. Scientists in this group have extensive experience in the application of electron microscopy and other sub-cellular investigative techniques to the study of numerous chemicals of environmental concern in the Puget Sound area.

The resources of this department as summarized above, together with those of other departments in the School of Public Health and the nearby NOAA laboratories, constitute an impressive concentration of scientific expertise and resources which, in my view, are capable of evaluating the full scope and implications of the Puget Sound chemical contamination issue. The urgency which this situation holds for the people and the environment of the Puget Sound area would seem to dictate that a consolidated regional program utilizing these already available resources would be a most effective way to address and resolve the scientific questions now at hand. On behalf of the advisory committee to the State Department of Fisheries and my academic colleagues who are concerned about this problem, I want to express my deep appreciation for your interests in this situation and for your efforts in pursuing appropriate ways of assessing and resolving the associated environmental and public health issues. I hope that the points I have raised herein will be helpful to you in this regard.

Sincerely,

James S Woods

James S. Woods, Ph.D., M.P.H.
Research Associate Professor

cc: Dr. Gil Omenn
Dr. Don Malins

2822 10th East
Seattle, Washington 98102

November 1, 1982

Senator Slade Gorton
3327 Dirksen Building
Washington, DC 20510

Dear Senator Gorton:

Congratulations for taking the pollution problems in Puget Sound seriously enough to hold a hearing in Seattle. We cannot take comfort however, in voluntary restrictions or laws banning use of toxic substances. A decade after such efforts began, PCB's (polychlorinated biphenyls) are not disappearing, because of the vast amounts remaining in old equipment and dumps. Not so long ago a PCB spill in a meat packing plant caused major losses for Washington State poultry farmers. Not only our vital poultry industry, but also fish hatcheries can suffer from contaminated feed supplies. Many chemicals, such as PCB's and mercury, present in seemingly innocuous amounts in parts of Puget Sound, accumulate to toxic levels in fish used in animal diets.

I do not say that current levels in any way endanger our human food supply. Nonetheless we need to implement new techniques for confining and destroying the large quantities of toxic chemicals currently residing in landfills and estuarine waters. Simple burial alone does not isolate these materials. They can vaporize and spread even to Antarctica. We need to develop modern chemical waste disposal facilities and insure their ultimate effectiveness. It is naive to expect toxic wastes to dissipate spontaneously.

I base my conclusions on the two decades I have spent studying the effects of chlorinated hydrocarbon pollution on the wholesomeness of marine fishery products (see attachment). Over the past few months I have consulted worldwide with experts in the field of pollution monitoring. I have been collecting current data on PCB's in fish and wildlife to determine trends over time. My work will be published as a chapter in the book, "PCB's in the Environment." Your hearing may produce anxiety among citizens of the Northwest. I hope it also holds promise of your intent to take action to protect our environment and our living resources. With that goal in mind, I submit this letter to the hearing record. I am prepared to provide you and your staff with additional information and assistance.

Sincerely,

Virginia F. Stout

Virginia F. Stout, Ph.D.
Research Chemist

Enclosure: Curriculum vitae

PORT OF SEATTLE
P.O. BOX 1209 SEATTLE, WASHINGTON 98111

November 4, 1982

The Honorable Slade Gorton
United States Senate
2988 Federal Office Building
915 Second Avenue
Seattle, Washington 98174

Dear Senator Gorton:

The Port of Seattle wishes to make the following comments regarding the issues of "Toxic Chemical Pollution of Portions of Puget Sound," discussed at the Field Hearing of the Senate Commerce, Science and Transportation Committee and the Senate Environment and Public Works Committee on October 25, 1982.

The Port of Seattle was created as a special purpose district to promote development of the regional economy through enhanced maritime commerece. The Port pursues this primary objective while recognizing a responsibility to minimize, to every feasible degree, the impact of its activities on public health, safety and the environment. The presence of concentrations of toxic chemicals in the Duwamish estuary is of primary concern to us since the maintenance of modern marine terminals and channels for deep-draft navigation unavoidably requires the periodic disruption, handling and disposal of these sediments.

The Port is the local sponsor of the proposed U.S. Army Corps of Engineers Duwamish Navigation Improvement Project. The proposed dredging and widening of the Duwamish Waterways, in addition to expanding the navigational capacity in the Duwamish basin, will remove the accumulated contaminated sediments from approximately 70% of the waterway between Spokane Street and First Avenue South. As local sponsor, the Port proposes to provide controlled, contained disposal of the sediments between two piers at Terminal 91. There the sediments will be capped with clean materials and effectively isolated from the marine environment.

Faced as it is with difficult choices regarding the allocation of scarce Federal funds, we hope Congress will choose to support projects which provide feasible and realistic solutions to difficult environmental problems in addition to providing the economic benefits of increased navigational efficiency. Increasing levels of sophistication in chemical instrumentation have meant that potentially toxic chemicals have been detected even in the polar ice caps. Any waterway adjacent to human activities will not be free of chemical contamination. We believe that Puget Sound is and can continue to be a clean and highly productive aquatic habitat as well as a world center for ocean-going commerce. Proper management of resources will mean these need not be mutually exclusive goals.

Sincerely,

Clifford C Muller

Clifford C. Muller
Director, Planning and Research

AK/0560p

November 12, 1982

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The Honorable Slade Gorton
United States Senator

Dear Senator Gorton:

Since there was not time for me to testify at your recent hearing on Puget Sound pollution, I pass the following along for your consideration. I live in West Seattle and am primarily concerned with the water quality of Elliott Bay. Several problems cone to mind. I heard on the radio that Dr. Malins presented you with a cancerous fish organ retrieved from a Puget Sound bottom fish. I've read his report and that act is worth a lot of words. The sad part is that dozens of people are taking fish like these in a subsistence fishery in the Duwamish River and very little has been done to explain to these people exactly what they are doing. Nothing has been done on-site as far as I know. Even a sign explaining the problem with pictures of the fish most likely to be dangerous would be a start. The Port of Seattle is also circulating an E.I.S. which would have the Corps of Engineers doing substantial dredging in this river. Since many of the chemical contaminants discussed in Dr. Malins report are quite heavy and settle into the sediment in the river, much of it will be dislodged and relocated by dredging. The recommended plan calls for these contaminated dredge spoils to be placed in a land fill site at Piers 90 and 91. I seriously question the ability to prevent these spoils from leaching back into the Sound. Maintenance dredging spoils are currently being dumped in the Sound at Four Mile Rock off Magnolia bluff and have been for years. I really don't believe this site has been monitored as thoroughly as it should be, and its' affect on marine life fully explored. The source of these contaminants must be identified and the discharge halted. An effort must be made to remove these contaminants from our rivers and marine waters.

NORTHWEST STEELHEAD & SALMON COUNCIL OF TROUT UNLIMITED

Another concern of mine has to do with sewage treatment and disposal. I view the recent battle over Metro's plans to route the Renton treatment plants outfall from the Green River to Seahurst near Point Pulley in Puget Sound with mixed emotions. There's no question the discharge will have to come out of the river, because by Metro's own admission, half the flow would be chlorine and ammonia by 1990. But the increased dumping of secondarily treated sewage in Puget Sound has gone beyond our knowledge of its affects. For example, the effects of chlorine on fish are only coming to light in the past few years. In fact, I believe a bill banning the use of chlorine in sewage treatment plants discharging to natural trout water, was signed into law in Maryland in 1981. The returns of hatchery Steelhead to Puget Sound seem to be substantially lower than their counterparts in rivers on the ocean. Chlorine isn't the only problem, but I would hope that we in the Northwest have learned from the mistakes of the Great Lakes or our own Lake Washington. Puget Sound sewage discharges should be dealt with as a regional problem because of the many agencies involved.

Paralytic Shellfish Poisoning or "Red Tide" also seems to inhabit our beaches in Southern Puget Sound more frequently than ever before. Maybe our measuring equipment is better, maybe it's a natural phenomena, maybe not. Are any of these problems interrelated or all of them?

I read some time ago that the Reagan administration had chopped the funding which brought about Dr. Malins' studies and others related to it. I feel you should do everything in your power to have that funding restored and renewed until we have the answers. I think Four Mile Rock should be examined and the effect of the dumping published. Finally, I think our methods of disposing of sewage should be examined with the possibility of tertiary treatment fully explored. I just can't believe that we can continue to dump millions of gallons into Puget Sound daily without affecting marine life.

Thank you in advance for your attention to these matters. I believe we still have some time to control our impact on our marine resources before we do irreversible harm. Your help will be most appreciated.

Frank Gaffney

Frank Gaffney
Environmental Chairman
Elliott Bay Chapter

cc: Jerry Pawletich NWSSC
Larry Roberts NWSSC
Ben Shuey W.E.C.

FG/mam